FOURTH FIVE-YEAR REVIEW REPORT FOR
MIDWAY LANDFILL SUPERFUND SITE
KING COUNTY, WASHINGTON

SEPTEMBER 2020

Prepared by

U.S. Environmental Protection Agency
Region 10
SEATTLE, WASHINGTON

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Calvin Terada, Division Director

Date

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LIST OF ABBREVIATIONS & ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
DCA	Dichloroethane
DO	Dissolved Oxygen
EA	Endangerment Assessment
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FYR	Five-Year Review
HDPE	High-Density Polyethylene
IC	Institutional Control
I-5	Interstate 5
MCL	Maximum Contaminant Level
µg/L	Micrograms Per Liter
mg/L	Milligrams Per Liter
MTCA	Model Toxics Control Act
NCP	National Contingency Plan
NOCOA	Notice of Construction Order of Approval
NPL	National Priorities List
NTU	Nephelometric Turbidity Units
OU	Operable Unit
O&M	Operation and Maintenance
PCE	Tetrachloroethylene
PQL	Practical Quantitation Limit
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RI/FS	Remedial Investigation/ Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SPU	Seattle Public Utilities
SVOC	Semi-Volatile Organic Compound
TCE	Trichloroethylene
VOC	Volatile Organic Compound
WAC	Washington Administrative Code
WSDOT	Washington State Department of Transportation
UU/UE	Unlimited Use and Unrestricted Exposure

I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP) (40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the fourth FYR for the Midway Landfill Superfund site (the Site). The triggering action for this statutory review is the completion date of the previous FYR. The FYR has been prepared because hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of one sitewide operable unit (OU). This FYR addresses the OU.

EPA remedial project manager (RPM) Ashley Grompe led the FYR. Participants included Min-soon Yim and Jeff Neuner from Seattle Public Utilities (SPU), Laura Lee and Lisa Gilbert from SPU contractor Parametrix, and Ryan Burdge and Kelly MacDonald from EPA FYR support contractor Skeo. The review began on 6/20/2019.

Site Background

The Site is located between Interstate 5 (I-5) and Highway 99, and between South 252nd Street and South 246th Street, in Kent, Washington (Figure 1). Currently, the Site includes a fenced 60-acre landfill, a flare station and a stormwater detention pond. Land use in the site vicinity consists of commercial and residential areas. Commercial establishments and light industry and manufacturing border both sides of Highway 99 in the area. Two upcoming Washington State Department of Transportation (WSDOT) and Sound Transit I-5 Corridor transportation projects will affect the landfill. There are plans to add lanes to I-5 and extend a light rail track on the eastern edge of the Site.[1] These development actions will require waste removal and replacement with structural fill, relocation of the eastern edge of the landfill cap and gas control systems, drainage improvements, and other actions. In addition, the Site is one of several options under consideration for a potential Sound Transit operations and maintenance facility.

From 1945 to 1966, a gravel pit was operated on site. In 1966, the city of Seattle (the City) began operating an unlined landfill on site. The City deposited about 3 million cubic yards of solid waste at the Site from 1966 to 1983. The landfill accepted demolition materials, wood waste and other slowly-decomposing materials. Some hazardous and industrial wastes (including about 2 million gallons of bulk industrial liquids from a single source) were also placed in the landfill. The Washington State Department of Ecology (Ecology) is responsible for the oversight management of the Site, as stipulated by an agreement with EPA Region 10, but EPA Region 10 retains responsibility to complete FYRs.

Groundwater conditions beneath the landfill are complex. Hydrogeologic investigations identified four major aquifers beneath and impacted by the landfill, in order of shallowest to deepest: Upper Gravel Aquifer, Sand Aquifer, and the Northern and Southern Gravel Aquifers. The aquifers have unique flow directions and rates, are interrupted by discontinuous aquitards, and are connected by several vertical flow paths, resulting in a complex pattern of vertical and lateral groundwater flow. Generally, groundwater flows from the north of the landfill, then beneath the landfill and to the east and southeast.

[1] More information is available on the WSDOT and Sound Transit I-5 Corridor projects: https://apps.ecology.wa.gov/gsp/Sitepage.aspx?csid=4729.

Appendix C provides a more detailed description of site hydrogeology. A well survey was recently conducted and indicated that there are several domestic and irrigation wells at various depths within one mile of the Site (Appendix H, Table I-1).

Appendix A includes a list of documents reviewed as part of this FYR. Appendix B includes a chronology of site events.

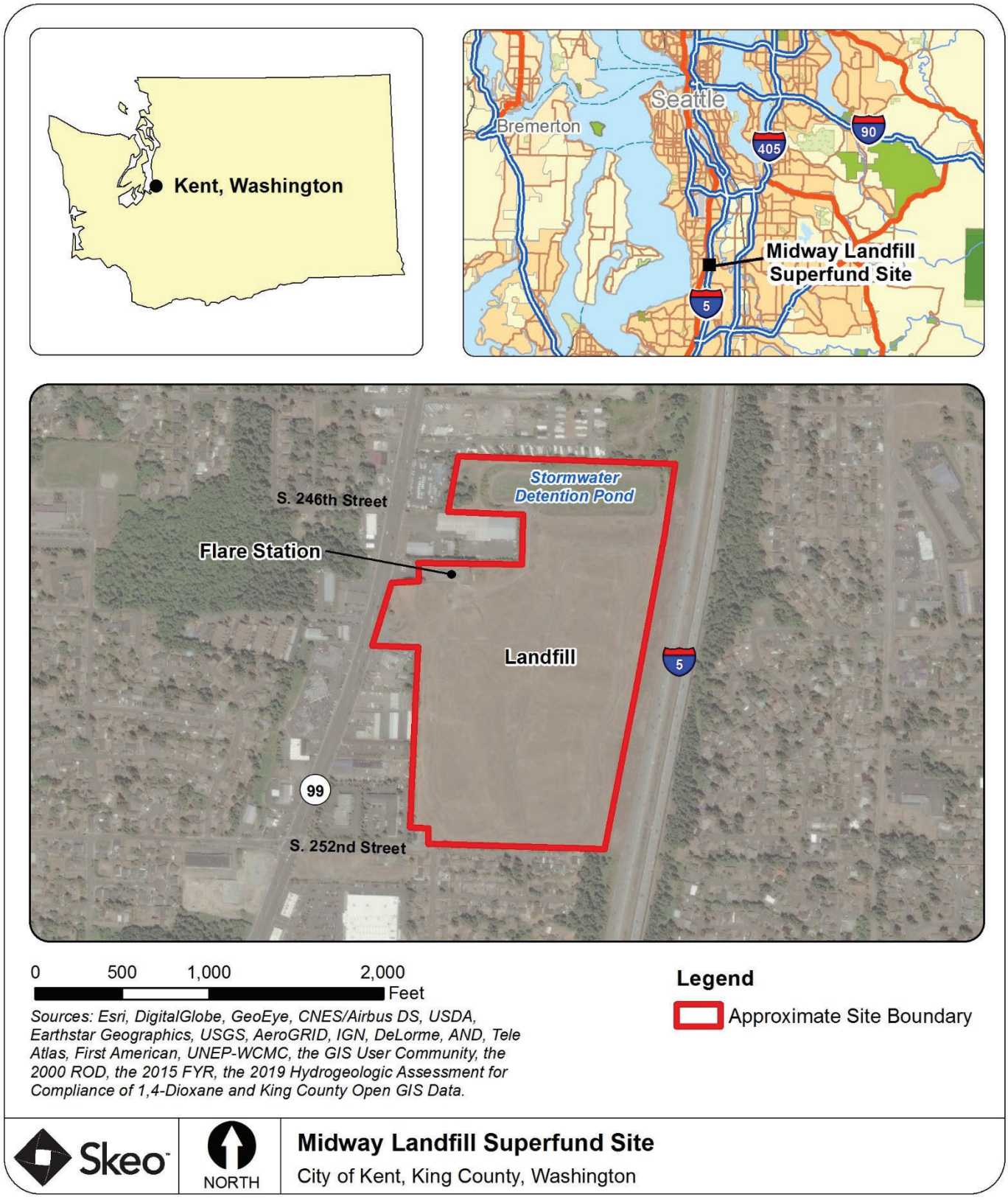
FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Midway Landfill		
EPA ID: WAD980638910		
Region: 10	**State:** WA	**City/County:** Kent/King

SITE STATUS	
NPL Status: Final	
Multiple OUs? No	**Has the Site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA
Author name: Ashley Grompe, with additional support provided by Skeo
Author affiliation: EPA Region 10
Review period: 6/20/2019 – 9/23/2020
Date of site inspection: 3/5/2020
Type of review: Statutory
Review number: 4
Triggering action date: 9/23/2015
Due date *(five years after triggering action date)*: 9/23/2020

Figure 1: Site Vicinity Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

In 1980, a state-mandated screening process for waste administered by the Seattle-King County Department of Public Health started. Its goal was to eliminate further disposal of hazardous waste at the Site. When the City closed the landfill in 1983, it covered the entire surface with a soil cover and began extensive testing of water and gas in the landfill and its vicinity. Groundwater samples from monitoring wells in and around the landfill and gas samples from gas probes indicated the presence of organic and inorganic contaminants outside the landfill boundary. In 1985, Ecology also began investigating the Site and found methane gas in nearby residences.

Before the cleanup work began in 1985, there were several potential exposure pathways. These pathways included acute hazards to residents due to high levels of methane gas reaching residential basements, and long-term potential risks from solvents in the groundwater if people had been drinking the groundwater. The risks from these possible exposures were greater than EPA's and the state of Washington's acceptable risk levels. Other possible exposures could have occurred through air emissions or through direct contact with the landfill contents.

The City's contractors prepared an Endangerment Assessment (EA) as part of the 1990 remedial investigation and feasibility study (RI/FS). Because the RI found little contamination in the surface water, seeps or soil, the EA concluded that the contaminants detected in these environmental media had not migrated from the landfill. The EA also found that there was no direct exposure pathway connecting leachate to either human or ecological receptors. There was concern about the indirect pathway of discharge of leachate into the groundwater system.

A baseline risk assessment that followed EPA Superfund guidance and reflected then-current conditions at the landfill was not done because the contaminants of concern (COCs), migration routes, and the risks to human health and the environment were characterized in the 1990 EA. The 2000 Record of Decision (ROD) noted that while the estimated future risk from drinking groundwater in the vicinity of the landfill following the early cleanup work was within the acceptable risk range, there was groundwater contamination above federal drinking water standards (maximum contaminant levels, or MCLs) in two monitoring wells east of the landfill and I-5. According to EPA policy, when MCLs are exceeded, action is generally warranted. In addition, state groundwater cleanup levels under the state of Washington's Model Toxics Control Act (MTCA) were exceeded. Because drinking this groundwater could result in an imminent and substantial endangerment to human health, remedial action was needed at the Site. Table 1 lists site COCs for groundwater.

Table 1: Groundwater COCs

COC	Media
1,2-Dichloroethane (DCA)	Groundwater
Vinyl chloride	
Manganese	

Response Actions

In October 1984, EPA proposed listing the Site on the Superfund program's National Priorities List (NPL) based on potential groundwater contamination. Pursuant to a cooperative agreement with EPA, Ecology was designated as the lead agency for the Site.

In September 1985, the City constructed gas migration control wells on the landfill property and gas extraction wells beyond the landfill property to control the subsurface migration of gas. Gas was found to have migrated up to 2,600 feet beyond the landfill prior to installation of the gas extraction system. In 1986, EPA finalized the

Site's listing on the NPL. In September 1988, the City entered a Response Order on Consent with Ecology to prepare a RI/FS for the landfill.

In May 1990, prior to completion of the RI/FS, the City and Ecology entered into a Consent Decree pursuant to MTCA. The Consent Decree set forth Ecology's determination that undertaking certain remedial actions prior to a Cleanup Action Plan (a MTCA decision document similar to a Superfund ROD) would provide immediate protection to public health and the environment. In this Consent Decree, the City agreed to finance and perform specific cleanup work that had four main elements:

- Construction of a landfill cover.
- Completion of a gas extraction system.
- Completion of a surface water management system.
- Preparation of a comprehensive Operation and Maintenance (O&M) Manual.

The Consent Decree also required that the City place a notice in the records of real property kept by the county auditor stating that the landfill was listed on the NPL, and provide a copy of the Consent Decree to any prospective purchaser or lessee of the property prior to the transfer of any legal or equitable interest in all or any portion of the landfill.

Table 2 summarizes the implementation of the work required by the Consent Decree.

Table 2: Remedial work implemented under the 1990 Consent Decree

Consent Decree-required Remedial Work	Implementation
Landfill gas control	An active gas control system was installed. Construction of the gas migration control system began in September 1985 and finished in March 1991. It originally included 87 gas extraction wells, 31 of which were located off the landfill in native soil. The off-landfill wells have since been abandoned or capped. In addition, about 70 off-landfill gas monitoring probes were installed to provide information on gas concentrations; about half of these probes have since been abandoned. The gas is extracted through the control wells at the landfill and routed to a permanent blower/flare system.
Landfill surface filling and grading	The landfill surface was regraded, which increased the soil cover over the landfill by 2 to 14 feet. The engineered grades improved surface water runoff and decreased infiltration. The fill was also compacted to reduce permeability and prepare the surface for the cover system. The work began in August 1988 and finished in June 1989.
Stormwater detention pond construction and associated dewatering and discharge system	A lined detention pond was put in north of the landfill. Regrading of the landfill surface redirected surface water, which previously infiltrated into the landfill, to the new pond. The detention pond is a 3-acre structure, lined with a 60-millimeter high-density polyethylene (HDPE) membrane to eliminate infiltration. The bottom of the pond was constructed below localized groundwater; therefore, a permanent dewatering system was also installed, and water is pumped into the pond. Construction of the stormwater detention pond began in August 1988 and was finished in June 1989.
Landfill cap installation	Construction of the final landfill cover began in October 1989 and finished in May 1991. It consists of the following layers from bottom to top: a 12-inch-thick layer of low permeability soil/clay material, a 50-millimeter HDPE flexible membrane, a drainage net, filter fabric, a 12-inch-thick drainage layer, and a 12-inch-thick topsoil layer.
Linda Heights Park stormwater diversion	The Linda Heights Park drain, a 30-inch culvert that drained directly into the landfill, was blocked. Stormwater is now routed through a pump station and a pipeline to the detention pond. The old discharge line to the landfill is still in place and functions as an overflow in the event of a pump station failure. The construction of this rerouting began in August 1989 and finished in 1991. The pump station and associated diversion of storm water was activated in January 1992.

Consent Decree-required Remedial Work	Implementation
O&M Plan	A comprehensive O&M Manual for short-term and long-term O&M activities for the systems constructed under the Consent Decree was prepared by the City and approved by Ecology in April 1992.
Deed notice	The deed notice was implemented; the Institutional Controls section of this FYR Report provides more information.

Because Ecology had not completed a final remedy selection decision document under the MTCA by early 2000, the two agencies agreed that EPA should prepare the final remedy selection document under CERCLA instead. EPA signed the ROD in September 2000 with Ecology's concurrence.

The 2000 ROD stated that containment at the landfill has been successful and reduced site risks. However, the containment measures already in place needed to be maintained, and institutional controls were necessary to ensure continued long-term protection of human health and the environment. The 2000 ROD identified the following remedial action objectives (RAOs) for the response action at the Site:

- To ensure containment is effective and working.
- To ensure containment will be maintained.
- To return groundwater to drinking water standards and state cleanup standards downgradient of the landfill boundary.
- To ensure no residential exposure to groundwater until groundwater cleanup standards have been met.

The remedy selected in the 2000 ROD included the following remedial components:

- Monitoring to:
    - Ensure the remedial systems are working as designed.
    - Ensure progress is being made toward meeting the groundwater cleanup standards.
    - Ensure adequate containment is maintained when and if major changes are approved by Ecology in site operations such as turning off or scaling down the gas collection system.
    - Demonstrate that the groundwater cleanup levels have been achieved.
- Continuing to operate and maintain all remedial elements required in the 1990 Consent Decree.
- Implementing three types of institutional controls:
    - The City will place a notice in the records of real property kept by the King County auditor, alerting any future purchaser of the landfill property, in perpetuity, that this property had been used as a landfill and was on EPA's NPL, and that future use of the property is restricted, per the 1990 Consent Decree.
    - The City needs to ensure continued O&M of the containment and monitoring systems if any portion of the property is sold, leased, transferred or otherwise conveyed, per the 1990 Consent Decree.
    - Notices are needed so that no water supply wells are constructed and used in areas with groundwater contamination emanating from the landfill, including at minimum:
        - Annual notices to the Seattle-King County Department of Public Health, Ecology, local water districts (currently the Kent and Highline water districts), and locally active well drillers of the groundwater conditions in the affected areas downgradient of the landfill.
        - The City will also annually notify the owner of Well #37 in writing of groundwater conditions around the well. Alternatively, the City can provide Ecology with adequate assurances that this well has been properly abandoned.[2]

The 2000 ROD states that the more stringent of federal drinking water standards and state cleanup standards under the MTCA are the cleanup levels. Table 3 lists groundwater cleanup goals and their basis. The point of compliance for the groundwater will be at the edge of the landfill waste as specified in a Compliance Monitoring

[2] In the 2000 ROD, Well #37 was identified as being an unused, covered well on privately owned property that was within 1,000 feet of the Site.

Plan approved by Ecology. All groundwater downgradient of this point of compliance will need to meet these cleanup goals for contaminants resulting from releases from the landfill before the Site is deleted from the NPL.

Table 3: Groundwater COC Cleanup Goals

Groundwater COC	2000 ROD Cleanup Goal	Basis
1,2-DCA	5 micrograms per liter (µg/L)	Federal Drinking Water Standard (MCL)
Vinyl chloride	0.02 µg/L[a]	MTCA Method B
Manganese	2.2 milligrams per liter (mg/L)	MTCA Method B

Notes:
Source: Table 8-1, 2000 ROD.
a. Pursuant to Washington Administrative Code (WAC) 173-340-707(2), Ecology will use the practical quantitation limit (PQL) of 0.2 micrograms per liter (µg/L) to determine compliance with this cleanup standard because the cleanup standard is lower than the PQL.

Status of Implementation

Several remedial elements were implemented under the 1990 Consent Decree prior to the 2000 ROD, as described in the Response Actions section of this FYR Report. This section summarizes implementation for the remedy components of the 2000 ROD.

The City has conducted performance and compliance monitoring since 1989. Monitoring includes fluid level monitoring, groundwater chemistry monitoring and landfill gas monitoring performed on an ongoing basis. The current monitoring program is described in the 2000 Midway Landfill Monitoring Plan. Monitoring data are discussed in further detail in the Data Review section of this FYR Report.

The City continues to conduct O&M activities for the landfill cover system, gas system and surface water systems. O&M requirements for the Site are described in 1992 Midway Landfill O&M Manual, which includes short-term and long-term O&M for the systems constructed under the Consent Decree. Ecology continues to oversee the City's O&M activities. Ecology can approve operational changes when such changes ensure that the Site and remedy will remain protective. The Seattle-King County Public Health Department has an opportunity to review requested operational changes.

Institutional Control (IC) Review

The 2000 ROD required several institutional controls, including: 1) a notice on the property alerting any future purchaser of the landfill property, in perpetuity, that this property had been used as a landfill and was on EPA's NPL and that future use of the property is restricted; 2) assurance by the City of continued O&M of the containment and monitoring systems if any portion of the property is sold, leased, transferred or otherwise conveyed; and 3) notices so that no water supply wells are constructed and used in areas with groundwater contamination emanating from the landfill. Site institutional controls are summarized below in Table 4.

The first two of the three institutional control requirements are addressed via a 2005 Declaration of Restrictive Covenant, which is in place on the landfill parcels (Figure 2). The full covenant is included in Appendix D. The covenant includes the following restrictions, verbatim:

- Any activity on the Property that may interfere with the Cleanup Action as defined in the ROD, is prohibited. Any future use of the Property shall not disturb the integrity of the final cover, or any other components of the containment system. Any future use of the Property shall not disturb, damage, or alter any component of the landfill gas extraction system, or any of its attendant monitoring probes or wells except as approved in writing by the Department of Ecology or its successor agency. Any activity on the Property that may result in the release of a hazardous substance that was contained as part of the Cleanup Action is prohibited. Any activity on the Property that may results in endangerment to human health or

the environment by hazardous substances contained on the Property or by gas generated by and emitted from the Property is prohibited.

- Except for groundwater monitoring, no groundwater may be taken for any purpose from any well on the Property without Department of Ecology ("Ecology") approval. No water supply wells may be installed on the Property.
- City must give thirty (30) days advance written notice to Ecology of the City's intent to convey any interest in the Property. No conveyance of title, easement, lease, or other interest in the Property shall be consummated by the City without adequate provision for continued monitoring, operation and maintenance of the Cleanup Action.
- City must restrict leases to uses and activities consistent with this Restrictive Covenant and notify all lessees of the restrictions on the use of the Property.
- City must notify and obtain approval from Ecology prior to any use of the Property that is inconsistent with the terms of this Restrictive Covenant. Ecology may approve any inconsistent use only after public notice and comment.
- The City shall allow authorized representatives of Ecology the right to enter the Property at reasonable times and with reasonable prior notice for the purpose of evaluating compliance with the Cleanup Action and to inspect records that are related to the Cleanup Action.
- The City reserves the right under WAC 173-340-440 to record an instrument that provides that this Restrictive Covenant shall no longer limit use of the Property or be of any further force or effect. However, such an instrument may be recorded only if Ecology, after public notice and opportunity for comment, concurs.

Per the third institutional control requirement, the City must send an annual written notice about the groundwater quality downgradient from the landfill to the Seattle-King County Department of Public Health, nearby water districts, locally active licensed well drillers, and Ecology. A map documenting the location of wells with COC concentrations above ROD cleanup levels was included in annual notices beginning in 2017. These notices are sent on an annual basis. A copy of the 2020 letter is in Appendix K.

SPU contractor Parametrix completed an updated well survey of private wells in the site vicinity as part of the 2019 1,4-dioxane hydrogeological assessment, which is further summarized in the Data Review section of this report. Appendix H includes a map of private wells near the Site and a table summarizing well information including the well type, use status, aquifer and position related to the Site. Downgradient or cross-gradient of the Site, the survey identified six wells that are in use or potentially in use. Of these, two are domestic wells for drinking water, and four are irrigation wells. One domestic well is in the Southern Gravel Aquifer, and the other domestic well is in the Alluvial Aquifer, which is not present in the immediate site area. The Southern Gravel Aquifer discharges to the Alluvial Aquifer east of the landfill. One of the domestic wells was installed in 2016 within the groundwater quality notification area. The presence of these wells, and the well installed in 2016 in particular, indicate that there may be an issue with the current groundwater quality notification system for local regulatory agencies and well drillers. It is currently unknown whether site-related COCs or 1,4-dioxane are present in these private wells.

Table 4: Summary of Planned and/or Implemented Institutional Controls (ICs)

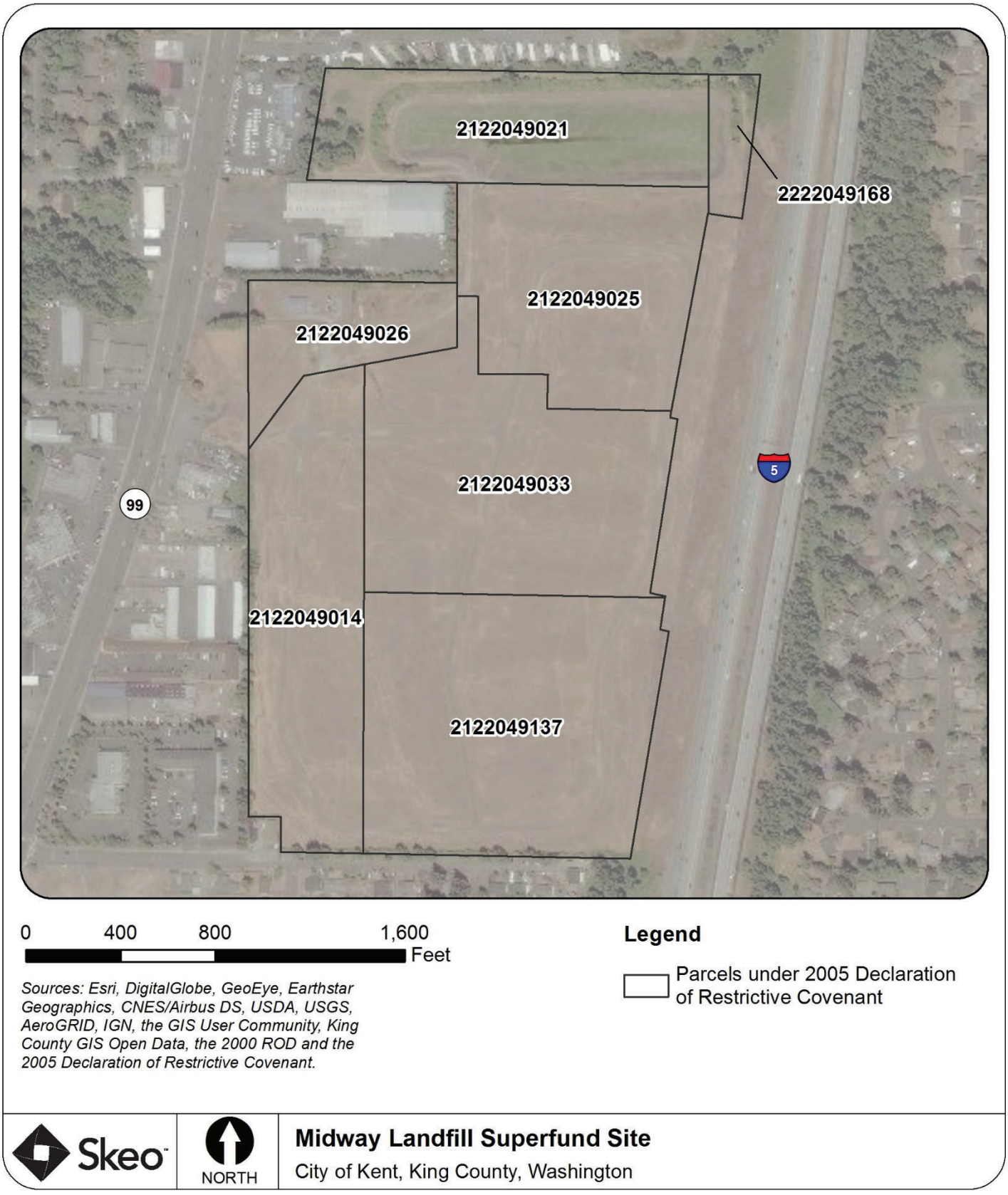
Media, Engineered Controls, and Areas That Do Not Support UU/UE Based on Current Conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Groundwater, soil, and remedy components at the landfill property	Yes	Yes	2122049014 2122049021 2122049025 2122049026 2122049033 2122049137 2222049168[a, b]	Assure continued integrity of the cleanup action and provide notice to land users	2005 Declaration of Restrictive Covenant
Downgradient Groundwater	Yes	Yes	Contaminated groundwater downgradient of the landfill	Notify parties of groundwater quality to prevent use of contaminated groundwater	Groundwater quality notice to Seattle-King County Department of Public Health, nearby water districts, locally active licensed well drillers and Ecology

Notes:

a. The 2005 Declaration of Restrictive Covenant also listed parcel 2122903307. However, this parcel number did not return any results in an online search in the parcel dataset in May 2020. It was not included in this table or in Figure 2.

b. The area within the approximate site boundary west of parcel 2122049026 that is not included in the 2005 Declaration of Restrictive Covenant is outside of the fenced landfill area.

Figure 2: Institutional Control Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

Systems Operations/Operation and Maintenance (O&M)

Regular operation and maintenance activities at the Site include monitoring, inspection and maintenance of groundwater, surface water collection and discharge systems, landfill gas collection and transmission systems, and the landfill cover. Groundwater monitoring includes groundwater hydraulic monitoring and groundwater quality monitoring as stated in the 2000 Monitoring Plan.

The detention pond is monitored five days per week. If the water level in the pond exceeds 1.0 foot, samples are collected at the three inlet locations (inflows from the landfill, Highway 99, and I-5) and discharge at the detention pond outlet and tested in the field for pH, temperature, dissolved oxygen (DO), turbidity and conductivity. Inspections of the surface water collection pipelines using a TV camera are conducted every three years. The most recent inspection was performed in August 2017, and no abnormalities or defects were noted in the piping. The next TV inspection will take place in 2020. No significant changes were made to the groundwater monitoring program or the surface water collection or discharge system during the past five years.

Inspection, maintenance, and monitoring for the landfill gas collection and transmission system are conducted per the 1992 O&M Plan. Monitoring of the gas extraction system includes daily manifold monitoring and monthly extraction well monitoring. The flare is continuously monitored to ensure that the mechanical systems are operating properly. Landfill staff routinely inspect the facility five days a week and respond to off-hour system alarms such as flame failure or temperatures out of permitted range on the enclosed flare. Landfill gas compliance probes are monitored weekly, monthly, or quarterly, depending on the compliance status of the probe. Landfill gas control updates at the flare system during this five-year period include:

- Montrose Air Quality Services source tested the flare on December 14, 2016. The final report for this source test, dated January 24, 2017, was submitted to the Puget Sound Clean Air Agency. The average non-methane organic compounds, as hexane, were 5.5 ppm, and when corrected to 3 percent O2, were 10.6 parts per million. The flare temperature, averaged over the period of the test, was 1,245 °F.
- A Notice of Construction Application for Permit Modification was prepared and delivered to the Puget Sound Clean Air Agency on June 5, 2017, to support modifications to the previous Notice of Construction Order of Approval (NOCOA) 8517 issued on June 20, 2001. The NOCOA 10440 modifications include lowering the operating temperature restriction based on the most recent successful source test results and allowing the injection of natural gas into the landfill gas stream to ensure stable flare operation. The Puget Sound Clean Air Agency awarded Order of Approval 11400 on October 11, 2017.
- In the first quarter of 2018, the Startup, Shutdown, and Malfunction (SSM) Plan for the Landfill Flare Supplemented with Natural Gas (SPU 2018) was completed to comply with Condition 10 of NOCOA No. 11400 and the requirements of 40 CFR 63.6(e)(3). The final plan is posted at the flare station.

As of 2016, landfill cap and cover integrity inspections are documented monthly in a log sheet based on the O&M Manual. Several localized areas east of the flare facility were noted to have experienced minor settlement that resulted in temporary pooling of standing water during periods of high rainfall in the winter of 2020. The localized areas that have experienced minor settlement will be investigated. Repairs will be conducted in accordance with the O&M Manual.

Following completion of the transportation construction projects, a revised or new O&M Manual and a revised Compliance Monitoring Plan (CMP) will be submitted for review and approval. The revised O&M Manual will reflect changes to the gas extraction system, stormwater pond, and groundwater monitoring network.

III. PROGRESS SINCE THE PREVIOUS REVIEW

This section includes the protectiveness determinations and statements from the previous FYR Report as well as the recommendations from the previous FYR Report and the status of those recommendations.

Table 5: Protectiveness Determinations/Statements from the 2015 FYR Report

OU #	Protectiveness Determination	Protectiveness Statement
Sitewide	Protectiveness Deferred	A protectiveness determination of the remedy at the Midway Landfill cannot be made at this time until further information on the extent of 1,4 dioxane is obtained. Further information will be obtained by additional water quality sampling downgradient of the site, either at existing and appropriately constructed wells identified by Ecology or by new wells installed for this purpose and by conducting a survey of the use of downgradient private wells. It is expected that the protectiveness determination can be made by September, 2018.

Table 6: Status of Recommendations from the 2015 FYR Report

Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
Upgradient sources of VOCs in groundwater will continue to limit the potential for the chemicals of concern in the Southern Gravel Aquifer to decrease below the ROD cleanup levels, especially because the concentrations of VOCs in upgradient well MW-21B are not decreasing.	Ecology will notify property owners with potential upgradient sources of contamination, including current COCs and 1,4-dioxane, by September 2016. Ecology will advise the property owners on cleanup requirements. By September 2018, property owners need to take substantive action on the upgradient source.	Ongoing	VOC concentrations in MW-21B remain above MCLs. EPA and Ecology are currently convening on appropriate next steps.	Planned: 9/30/2021
1,4-dioxane has been found in several wells at concentrations that exceed regulatory levels. The ROD contains no cleanup level for 1,4-dioxane. Additionally, the first five year review identified a change to vinyl chloride cleanup level.	EPA will write an Explanation of Significant Difference to add 1,4-dioxane as a COC to the ROD. EPA will consider whether the vinyl chloride cleanup level established in the ROD should be changed, and if so, it will be documented in an ESD.	Considered But Not Implemented	EPA is still assessing whether 1,4-dioxane is a site-related COC and determined it was not necessary to issue an Explanation of Significant Differences (ESD) at this time. EPA and Ecology will examine concentration trends from further delineation efforts and reconsider if conditions worsen. EPA is still considering whether a cleanup goal change is needed for vinyl chloride.	Completed: 10/29/2019

Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
The extent of the 1,4-dioxane plume has not been delineated.	Ecology will do a search to determine the location of any wells constructed within a one mile radius of Midway Landfill and 1) identify the status of those wells (active, inactive) 2) determine the use (water supply/irrigation/monitoring/ etc.) 3) compile well construction logs as available. Based on the well construction logs, Ecology will determine if any of these wells are constructed in a manner that would allow for water quality sampling that would allow further characterization and delineation of the contaminant plume downgradient of the site. If no existing wells can be confidently used for this purpose, Ecology will identify locations for new monitoring wells to delineate the extent of the 1,4-dioxane plume.	Completed	In 2019, SPU contractor Parametrix completed a 1,4-dioxane hydrogeological assessment, which included identifying wells within a 1-mile radius of the Site and their statuses. Appendix H provides information gathered from this well survey. SPU plans to conduct a sampling event at 1) selected currently unused monitoring wells in the Sand Aquifer and Southern Gravel Aquifer to evaluate flow pathways; and at 2) available water wells in the Southern Gravel Aquifer and located further downgradient of monitoring wells where 1,4-dioxane exceeds regulatory criteria.	Completed: 10/29/2019
The extent of the 1,4-dioxane plume is unknown. It is therefore uncertain whether or not the ICs prohibiting water supply well drilling in "the affected area" are protective.	Ecology will send out letters to all properties in a one mile radius from Midway Landfill to determine if they contain a well, if that well is being used, and for what purpose (e.g. drinking water, irrigation, etc). In the event that a property owner is actively using a well, Ecology will notify the owner of the potential risks immediately.	Under Discussion	EPA is still assessing whether 1,4-dioxane is a site-related COC. Downgradient or cross-gradient of the Site, the well survey identified six wells that are in use or potentially in use. Of these, two are domestic wells for drinking water, and four are irrigation wells. The City plans to provide well users an advisory letter on 1,4-dioxane, gather information on the wells and offer to sample the wells.	Planned: 12/31/2020

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Community Involvement and Site Interviews

A public notice was made available by a newspaper posting in the Kent Chronicle print edition and online on August 7th and August 14th, 2020 (Appendix E). This notice was also added to the EPA site profile page on July 30th, 2020. Both publications stated that the FYR was underway and invited the public to submit any comments to the EPA. The results of the review and the report will be made available on EPA's Site webpage and at the Site's information repository, Woodmont Library, located at 6809 Pacific Highway South, in Des Moines, Washington 98198.

Data Review

Annual Groundwater Monitoring

During this FYR period, groundwater was monitored annually in May from 2015 to 2019 in the Upper Gravel Aquifer, the Sand Aquifer and the Southern Gravel Aquifer. COCs manganese, vinyl chloride, and 1,2-DCA were monitored, in addition to several other dissolved metals, semi-volatile organic compounds (SVOCs) and volatile organic compounds (VOCs). Wells monitored during this FYR period are shown on Figure 3. Potentiometric surface maps for the three aquifers, time-series plots for select contaminants, and historical groundwater data are included in Appendix J. Overall, as evidenced in the time-series plots in Appendix J, groundwater concentrations are still above ROD cleanup goals or drinking water standards for some contaminants but have declined from historical levels (except for upgradient concentrations of trichloroethylene (TCE) and tetrachloroethylene (PCE), which show increasing trends).

Upper Gravel Aquifer

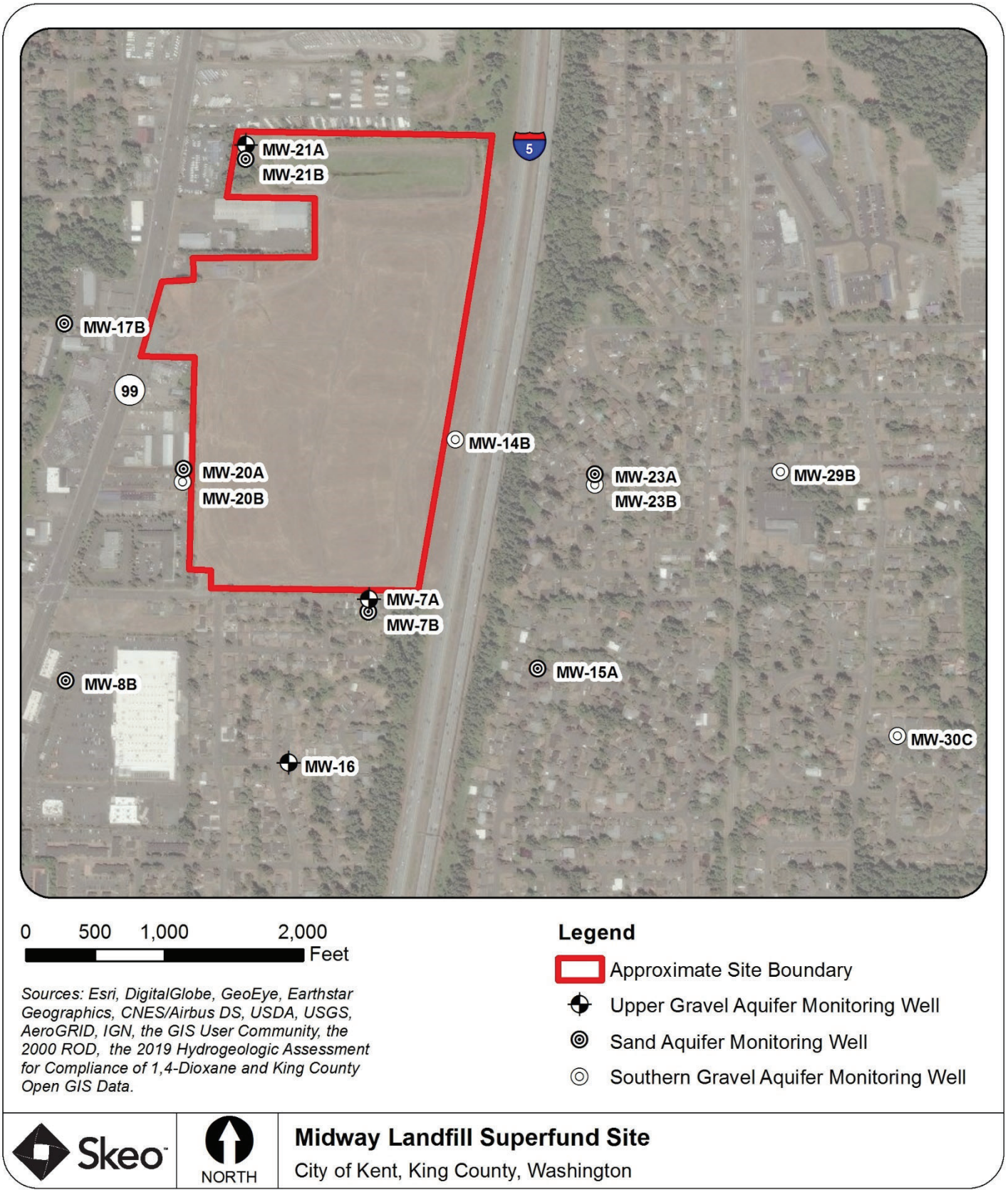
The Upper Gravel Aquifer monitoring well network includes upgradient wells MW-16 and MW-21A and downgradient well MW-7A. MW-7A has been dry since 1992 due to declining groundwater levels in the Upper Gravel Aquifer. During this FYR period (2015-2019), groundwater was sampled from MW-16 and MW-21A. Concentrations for COCs and 1,4-dioxane in these wells are summarized in Table 7. Manganese was detected during this FYR period, but concentrations were always below the cleanup goal, which is consistent with historical data (see time-series plot in Exhibit J-2, Appendix J). Vinyl chloride concentrations were always non-detect, but on several occasions the detection limit exceeded the ROD cleanup goal of 0.02 micrograms per liter (µg/L); this is consistent with the past 20 years of data for vinyl chloride in the Upper Gravel Aquifer (Exhibit J-2, Appendix J). Concentrations of 1,2-DCA and 1,4-dioxane were all below detection.

Table 7: COCs and 1,4-Dioxane Concentrations in the Upper Gravel Aquifer from this FYR Period

		Manganese (mg/L)	1,2-DCA (µg/L)	Vinyl Chloride (µg/L)	1,4-Dioxane (µg/L)
ROD cleanup goal		2.2	5	0.02	-
MTCA criterion		-	-	-	0.4375
MW-16 (upgradient)	5/7/2015	0.092	1.0 U	0.020 U	0.4 U
	5/5/2016	0.142	1.0 U	0.20 U	0.4 U
	5/3/2017	0.101	1.00 U	0.20 U	0.4 U
	5/8/2018	0.0943	1.00 U	0.020 U	0.4 U
	5/7/2019	0.095	1.00 U	0.200 U	0.4 U
MW-21A (upgradient)	5/5/2015	0.001	1.0 U	0.020 U	0.4 U
	5/3/2016	0.026	1.0 U	0.20 U	0.4 U
	5/2/2017	0.0274	1.00 U	0.20 U	0.4 U
	5/9/2018	0.0241	1.00 U	0.020 U	0.4 U
	5/8/2019	0.0010 U	1.00 U	0.200 U	0.4 U

Notes:
Source: 2020 Remedial Action Status Report.
U = Indicated the compound was undetected at the reported concentration

Figure 3: Detailed Site Map



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding EPA's response actions at the Site.

Sand Aquifer

The Sand Aquifer monitoring well network includes upgradient wells MW-8B, MW-17B and MW-21B and downgradient wells MW-7B, MW-15A, MW-20A and MW-23A. Since the remedial action, water levels in the Sand Aquifer have declined due to decreased discharge from the Upper Gravel Aquifer, and wells MW-20A and MW-23A have routinely been dry. During this FYR period, groundwater was sampled in the Sand Aquifer from wells MW-7B, MW-8B, MW-15A, MW-17B and MW-21B. Concentrations in these wells for COCs, 1,4-dioxane, and select VOCs that exceed MCLs are summarized in Table 8. Concentrations of 1,2-DCA were all below detection or below the cleanup goal. Manganese was detected in all wells but concentrations only exceeded the ROD cleanup goal of 2.2 milligrams per liter (mg/L) in well MW-7B, with relatively stable concentrations (ranging from 2.29 mg/L to 2.48 mg/L during this FYR period). Concentrations of manganese in MW-7B have exceeded the cleanup goal since monitoring began in this well (2011), but they overall demonstrate a declining trend (see time-series plot in Exhibit J-2, Appendix J). MW-7B is at the southeastern, downgradient edge of the landfill.

Vinyl chloride concentrations exceeded the ROD cleanup goal of 0.02 µg/L in MW-7B, MW-17B and MW-21B. In all these wells, vinyl chloride concentrations have declined from historical highs, but concentrations still oscillated between non-detection and exceeding the cleanup goal (see time-series plot in Exhibit J-2, Appendix J). In some instances, the detection limit was above the ROD cleanup goal. Concentrations of 1,4-dioxane consistently exceeded the MTCA Method B cleanup level of 0.4375 µg/L in wells MW-7B, MW-17B and MW-21B (Table 8). MW-17B and MW-21B are upgradient of the landfill. MW-7B is downgradient of the landfill. The 1,4-dioxane concentrations between these upgradient and downgradient wells were fairly consistent, but the highest 1,4-dioxane concentration in this aquifer during this FYR period was found in upgradient well MW-21B (2.8 µg/L). While both 1,4-dioxane and vinyl chloride exceedances were present in downgradient well MW-7B, they were not detected in well MW-15A, which is downgradient of MW-7B.

The 2015 FYR Report noted that upgradient sources of VOCs in groundwater would limit the potential for COCs to fall below the ROD cleanup goals, as evidenced by VOC concentrations in MW-21B.[3] In the last five years, TCE concentrations in MW-21B have increased above the MCL of 5 µg/L to 6.26 µg/L in May 2019; this appears to be a slight upward trend when compared to historical TCE concentrations (Exhibit J-2, Appendix J). PCE concentrations in MW-21B remained significantly above the MCL of 5 µg/L, ranging from 110 µg/L to 130 µg/L in this FYR period; this is consistent with PCE concentrations from the previous FYR period but is part of an overall upward trend (Exhibit J-2, Appendix J). TCE and PCE were not detected in monitoring wells downgradient of the Site during this FYR period in the Sand Aquifer.

Table 8: COCs, 1,4-Dioxane, PCE and TCE Concentrations in the Sand Aquifer from this FYR Period

		Manganese (mg/L)	1,2-DCA (µg/L)	Vinyl Chloride (µg/L)	1,4-Dioxane (µg/L)	TCE (µg/L)	PCE (µg/L)
ROD cleanup goal		2.2	5	0.02	-	-	-
MTCA criterion or MCL		-	-	-	0.4375 (MTCA)	5 (MCL)	5 (MCL)
MW-7B (downgradient)	5/6/2015	2.48	1.0 U	0.17	1.0	1.0 U	1.0 U
	5/4/2016	2.44	1.0 U	0.02 U	0.6	1.0 U	1.0 U
	5/3/2017	2.47	1.00 U	0.02 M, U	1.0	1.00 U	1.00 U
	5/8/2018	2.29	1.00 U	0.0954	2.0	1.00 U	1.00 U
	5/7/2019	2.32	1.00 U	0.200 U	1.3	1.00 U	1.00 U
MW-15A (downgradient)	5/7/2015	0.002	1.0 U	0.020 U	0.4 U	1.0 U	1.0 U
	5/5/2016	0.002	1.0 U	0.20 U	0.4 U	1.0 U	1.0 U
	5/4/2017	0.0010 U	1.00 U	0.20 U	0.4 U	1.00 U	1.00 U

[3] The 2015 FYR Report issue and recommendation commented on VOCs in the Southern Gravel Aquifer in MW-21B. However, MW-21B is in the Sand Aquifer.

		Manganese (mg/L)	1,2-DCA (µg/L)	Vinyl Chloride (µg/L)	1,4-Dioxane (µg/L)	TCE (µg/L)	PCE (µg/L)
ROD cleanup goal		2.2	5	0.02	-	-	-
MTCA criterion or MCL		-	-	-	0.4375 (MTCA)	5 (MCL)	5 (MCL)
	5/7/2018	0.00273	1.00 U	0.020 U	0.4 U	1.00 U	1.00 U
	5/6/2019	0.0010 U	1.00 U	0.200 U	0.4 U	1.00 U	1.00 U
MW-8B (upgradient)	5/6/2015	0.087	1.0 U	0.02 U	0.4 U	1.0 U	1.0 U
	5/4/2016	0.047	1.0 U	0.20 U	0.4 U	1.0 U	1.0 U
	5/4/2016 (Duplicate)	0.049	1.0 U	0.20 U	0.4 U	1.0 U	1.0 U
	5/4/2017	0.0614	1.00 U	0.20 U	0.4 U	1.00 U	1.00 U
	5/8/2018	0.351	1.00 U	0.020 U	0.4 U	1.00 U	1.00 U
	5/7/2019	0.275	1.00 U	0.200 U	0.4 U	1.00 U	1.00 U
MW-17B (upgradient)	5/5/2015	0.046	2.8	0.11	1.5	1.0 U	1.0 U
	5/3/2016	0.044	2.6	0.20 U	1.0	1.0 U	1.0 U
	5/2/2017	0.0425	2.11	0.20 U	1.5	1.00 U	1.00 U
	5/9/2018	0.0315	2.10	0.0375	0.9	1.00 U	1.00 U
	5/8/2019	0.0330	2.14	0.200 U	0.7	1.00 U	1.00 U
MW-21B (upgradient)	5/5/2015	0.372	1.0 U	0.031	2.8	4.6	110
	5/3/2016	0.342	1.0 U	0.20 U	1.9	4.6	110
	5/2/2017	0.346	1.00 U	0.20 M, U	1.7	5.92	130
	5/9/2018	0.341	1.00 U	0.0299	1.9	6.68	128
	5/8/2019	0.345	1.00 U	0.200 U	1.5	6.26	118

Notes:
Source: 2020 Remedial Action Status Report.
U = Indicated the compound was undetected at the reported concentration
M = Estimated value for an analyte detected and confirmed by an analyst but with low spectral match parameters
Highlight = Concentration exceeds standard

Southern Gravel Aquifer

During this FYR period, groundwater was sampled in the Southern Gravel Aquifer from wells MW-14B, MW-20B, MW-23B, MW-29B and MW-30C. Concentrations for COCs and 1,4-dioxane in these wells are summarized in Table 9. Concentrations of 1,2-DCA were all below detection or below the cleanup goal. Manganese was detected in all wells but only exceeded the cleanup goal once in MW-20B in May 2015, with a concentration of 2.27 mg/L (just above the cleanup goal of 2.2 mg/L). This appears to be part of an overall downward trend when compared to historical manganese concentrations (Exhibit J-2, Appendix J).

Concentrations of vinyl chloride exceeded the cleanup goal (0.02 µg/L) in all wells during this FYR period. Vinyl chloride concentrations ranged from non-detect to 0.516 µg/L (Table 9). Concentrations fluctuated between exceedances and non-detects in well MW-14B and MW-23B, while exceedances were more consistent in wells MW-20B, MW-29B and MW-30C (Table 9). In some instances, the detection limit was above the ROD cleanup goal. Exceedances of vinyl chloride in wells MW-29B and MW-30C, which are the wells sampled in this aquifer that are furthest downgradient of the Site, indicate the extent of vinyl chloride may not be delineated. Overall concentrations in wells MW-29B and MW-30C have declined from historical levels but remain above the ROD cleanup goal.

Concentrations of 1,4-dioxane consistently exceeded the MTCA Method B cleanup level of 0.4375 µg/L in all wells. Concentrations generally trended upward in well MW-14B, downward in MW-20B, remained stable in MW-23B and MW-30C, and fluctuated in MW-29B. The highest 1,4-dioxane concentrations were found in MW-20B, with concentration ranging from 27 µg/L in 2015 to 12.9 µg/L in 2019. The extent of 1,4-dioxane is currently being investigated with the proposed additional sampling events summarized later in this Data Review section.

Table 9: COCs and 1,4-Dioxane Concentrations in the Southern Gravel Aquifer from this FYR Period

		Manganese (mg/L)	1,2-DCA (µg/L)	Vinyl Chloride (µg/L)	1,4-Dioxane (µg/L)
ROD cleanup goal		2.2	5	0.02	-
MTCA criterion		-	-	-	0.4375
MW-14B (downgradient)	5/5/2015	0.861	1.0 U	0.24	4.1
	5/3/2016	0.837	1.0 U	0.20 U	5.4
	5/2/2017	0.834	1.00 U	0.20 M	6.8
	5/8/2018	0.867	1.00 U	0.104	10.3
	5/7/2019	0.884	1.00 U	0.200 U	10.3
	5/7/2019 (Duplicate, MW-35)	0.877	1.00 U	0.200 U	9.6
MW-20B (downgradient)	5/6/2015	2.27	1.0 U	0.29	27
	5/4/2016	2.11	1.0 U	0.33 M	18
	5/3/2017	1.92	1.00 U	0.346	19.9
	5/9/2018	1.70	1.00 U	0.257	17.6
	5/9/2018 (Duplicate, MW-35)	1.71	1.00 U	0.266	19.0
	5/8/2019	1.61	1.00 U	0.200 U	12.9
MW-23B (downgradient)	5/7/2015	0.121	1.7	0.098	1.3
	5/7/2015, (Duplicate MW-35)	0.121	1.7	0.099	1.2
	5/5/2016	0.123	2.2	0.20 U	1.5
	5/4/2017	0.118	1.56	0.20 M	2.0
	5/4/17 (Duplicate MW-35)	0.115	1.49	0.20 M, U	2.3
	5/7/2018	0.105	1.48	0.0866	2.1
	5/6/2019	0.109	1.81	0.200 U	1.8
MW-29B (downgradient)	5/4/2015	0.858	3.8	0.48	7.9 J
	5/4/2015	0.861	3.9	0.44	12 J
	5/2/2016	0.830	3.9	0.49 M	11
	5/1/2017	0.820	3.54	0.516	13.8
	5/1/17 (Duplicate MW-31)	0.817	3.52	0.450	11.7
	5/7/2018	0.805	3.37	0.335	12.5
	5/6/2019	0.812	3.92	0.337	8.8
	5/6/19 (Duplicate MW-31)	0.801	3.91	0.330	9.0
MW-30C (downgradient)	5/4/2015	0.678	1.0 U	0.200	4.2
	5/2/2016	0.638	1.0 U	0.210 M	4.4
	5/2/16 (Duplicate MW-31)	0.639	1.0 U	0.200 M	4.7
	5/1/2017	0.663	1.00 U	0.241	6.4
	5/7/2018	0.644	1.00 U	0.172	5.6
	5/7/18 (Duplicate MW-31)	0.691	1.00 U	0.173	5.5
	5/6/2019	0.669	1.03	0.200 U	4.8

Notes:
Source: 2020 Remedial Action Status Report.
U = Indicated the compound was undetected at the reported concentration
J = Indicated the compound was detected at an estimated concentration
M = Estimated value for an analyte detected and confirmed by an analyst but with low spectral match parameters
Highlight = Concentration exceeds standard

2019 1,4-Dioxane Assessment

In response to several issues and recommendations from the 2015 FYR Report, SPU contractor Parametrix completed an assessment of 1,4-dioxane in 2019. The report noted that 1,4-dioxane concentrations were above the MTCA Method B cleanup level in eight of the currently sampled 12 monitoring wells at the Site, with highest

concentrations occurring in the Southern Gravel Aquifer. The assessment also included an updated well survey of private wells in the site vicinity (Appendix H). Twelve wells were identified as in use, potentially in use, or not in use but potentially operable. Of the eight in use or potentially in use wells, six are irrigation wells and two are domestic wells used for drinking water.

The report recommended the following actions:

1) Additional sampling of downgradient and cross-gradient locations:
    a. SPU plans to pursue an incremental approach to further investigate the extent of 1,4-dioxane in groundwater downgradient of the landfill, including a one-time initial sampling event for 1,4-dioxane at the following locations: 1) selected currently unused site wells in the Sand Aquifer and the Southern Gravel Aquifer to further evaluate flow pathways; and 2) available water wells in the Southern Gravel Aquifer and located further downgradient of monitoring wells MW-20B, MW-29B, and MW-30C where 1,4-dioxane exceeds regulatory criteria.
    b. If results of the investigation show that 1,4-dioxane is present in further downgradient wells, or if no wells are available for sampling, additional wells may be selected or installed if concentrations remain above regulatory criteria.
    c. Owners of domestic wells that are in use or potentially in use for domestic purposes within 1 mile of the Site and are located in hydraulically downgradient or cross-gradient locations from the Site will be contacted to determine if their well is being used, and the City will offer to sample their well.
2) Evaluation of upgradient sources:
    a. Several potential 1,4-dioxane sources were noted upgradient of the Site. The report suggested that further testing for 1,4-dioxane at these other release sites may be necessary to differentiate and identify 1,4-dioxane sources.

Surface Water Monitoring

Three hundred seventy observations were made between 2015 through 2019 when the detention pond level exceeded 1.0 foot. Most of the data were collected from October through early May during the wet season. Most of the data for the detention pond discharge samples collected at the pond outlet were within compliance criteria. The exceptions were: 38 of the 353 measurements for DO (criteria >8.0 mg/L), 23 of the 368 measurements for pH (criteria to be within 6.5 to 8.5 units), and four of the 355 measurements for turbidity (criteria 29 Nephelometric Turbidity Units (NTU)). The average discharge pH was 7.1, the minimum was 6.1 and the maximum was 9.2. There were no exceedances at the discharge for temperature (criteria <18 degrees Celsius) or conductivity (criteria <400 µs/cm).

Some of the 2015 through 2019 measurements for these parameters were also out of compliance in the inflow samples. In general, conductivity and turbidity were higher in the inflow from Highway 99 and I-5 than in the detention pond discharge, which was comparable to the landfill inflow.

The pH of the I-5 and Highway 99 inflow samples was generally higher than the pH of the pond discharge, which was comparable to the landfill inflow. Measurements of pH exceeding 8.5 units were observed in detention pond discharge samples between 2015 through 2017, but were not observed during 2018 and 2019.

There is no discernable correlation between the out-of-compliance measurements and the pond level or precipitation measurements. It is possible that lower DO measurements and the exceedances of pH may be related to the presence of wildlife such as waterfowl.

After exiting the detention pond, the water flows through over 1 mile of discharge pipe, undergoing a substantial gradient drop, and it passes through a baffled outlet structure prior to discharging into the north fork of McSorley Creek. Over the course of this piped flow, the water is expected to undergo substantial aeration that would increase its DO to above 8.0 mg/L and deposit excess sediment load to reduce turbidity.

Gas Monitoring

Landfill gas compliance probes are monitored weekly, monthly, or quarterly, depending on the compliance status of the probe. There were 5,648 landfill gas measurements between 2015 and 2019. Methane was detected on 214 occurrences. No methane above 5 percent by volume was detected in any of the probes, and the Site remained in compliance for the five-year period.

Gas probe AM is located in the northeast portion of the Site and is outside of the influence of the current gas extraction system. This gas probe has three completions, AM-Shallow, AM-Middle, and AM-Deep. Past data for samples collected from AM-Shallow were above the regulatory value for methane (5 percent, lower explosive limit) from 2010 through 2012. However, data collected since 2012 in AM-Shallow have been below the regulatory value ranging from 0 to 4.9 percent methane. Data collected from AM-Middle ranged from 0 to 0.6 percent methane and AM-Deep ranged from 0 to 0.1 percent methane. These probes have not historically exceeded the regulatory value.

Site Inspection

The site inspection took place on 3/5/2020. Participants included EPA RPM Ashley Grompe, Min-soon Yim and Jeff Neuner from SPU, Laura Lee and Lisa Gilbert from SPU contractor Parametrix, and Ryan Burdge and Kelly MacDonald from EPA FYR support contractor Skeo. The purpose of the inspection was to assess the protectiveness of the remedy. The site inspection checklist and photographs are available in Appendices G and H, respectively.

Site inspection participants began the tour on the western side of the landfill. The entrance to the landfill had a locked gate with signage indicating the area was a landfill and that dumping and unauthorized personnel were not permitted on site. Site fencing was in excellent condition. The group then inspected the flare/blower station, which was also in good condition. The stormwater detention pond had abundant wetland vegetation, and the stormwater drainages inspected were clear. The group also walked the landfill cap. Overall, it was in good shape. However, there was evidence that moles had dug into the cap in some areas, and there were a few areas of settlement and ponding on the cap. Several golf balls were found in one area of the cap, but no site trespassing was evident. The gas collection systems on top of the cap appeared to be in good condition. The group then visited the eastern part of the Site, which is the planned location of the rail extension and highway expansion. No issues were noted.

Skeo visited the site information repository, Woodmont Library, located at 6809 Pacific Highway South in Des Moines. The library had one site-related document available (the January 2020 public comment period document from Ecology related to the upcoming I-5 expansion and light rail extension). It was not sent to the library. A library patron printed it and placed it in the reference section.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

Question A Summary:

The remedy is partially functioning as intended. However, private well owners have not yet been notified of the potential presence of contamination in their wells and offered to have their wells sampled. Without more information about whether this is a potential exposure pathway (i.e., whether contaminants are present in wells, or whether wells are confirmed to be in use), a current protectiveness determination cannot be made.

The remedy included a landfill cover, gas extraction, stormwater diversion, O&M activities, monitoring and institutional controls. Overall, the landfill cover remains in good condition, with some minor ponding and settlement issues noted on the eastern edge. This area will be regraded during the light rail construction. Gas extraction, O&M activities and monitoring are ongoing. Gas data indicated that no methane above 5 percent by

volume was detected in any of the probes, and the Site remained in compliance for the five-year period. Stormwater on the landfill is diverted to the stormwater detention pond. Most of the surface water sampling data for the detention pond discharge were within compliance criteria. While some samples did not meet compliance criteria, after the water exits the detention pond, the water is expected to undergo substantial aeration that would increase its DO and deposit excess sediment load to reduce turbidity. Institutional controls are in place to prevent use of contaminated groundwater, ensure continued integrity of the cleanup action and provide notice to land users of the landfill property.

Groundwater monitoring results indicate no contamination above cleanup goals in the Upper Gravel Aquifer. In the Sand Aquifer, manganese and vinyl chloride remain above regulatory criteria, but concentrations in downgradient well MW-15A are either non-detect or below regulatory criteria. Upgradient VOC concentrations in the Sand Aquifer have remained stable or increased, but this does not appear to be site related. In the Southern Gravel Aquifer, vinyl chloride exceeded the cleanup goal in the most downgradient wells sampled, indicating the extent of vinyl chloride may not be delineated. Additional sampling downgradient of these wells may be warranted. This discussion is ongoing with Ecology and the timing of this sampling will be added in the 2021 technical memorandum.

Concentrations of 1,4-dioxane exceeded the regulatory standard in both the Sand Aquifer and the Southern Gravel Aquifer. SPU is still investigating 1,4-dioxane in the site vicinity and plans to evaluate upgradient sources and continue downgradient sampling in water wells or additional monitoring wells as needed. EPA and Ecology will determine appropriate actions regarding 1,4-dioxane following these actions.

The presence of two domestic and four irrigation wells that are in use or potentially in use and downgradient or cross-gradient of the Site and the installation of the domestic well in 2016 within the groundwater quality notification area both indicate issues with the current groundwater quality notification system for local regulatory agencies and well drillers.

The Site is undergoing redevelopment related to WSDOT and Sound Transit I-5 Corridor transportation projects to add lanes to I-5 and extend a light rail track on the eastern edge of the Site. Ecology completed a Consent Decree Amendment, Prospective Purchaser Consent Decree, Cleanup Action Plan Amendment, and Public Participation Plan in early 2020. Following completion of the project, the City of Seattle, Sound Transit, and WSDOT will make some changes in property ownership. The Sound Transit Federal Way Link Extension rail alignment property currently owned by WSDOT will become owned by Sound Transit. The new Prospective Purchaser Consent Decree between Ecology and Sound Transit defines requirements for Sound Transit's long-term maintenance of their portion of the Site to ensure continued environmental protection. The Consent Decree Amendment between Ecology and the City of Seattle and the new Prospective Purchaser Consent Decree between Ecology and Sound Transit will all ensure implementation of the required actions defined in the Cleanup Action Plan Amendment. These documents are publicly available on Ecology's Site webpage.

Several monitoring wells on the eastern edge of the landfill are expected to be removed during this construction. The City of Seattle sent the EPA and Ecology a letter with recommendations for necessary well abandonments on April 9, 2020. The City anticipates that the removed wells will not affect future determinations of compliance with groundwater cleanup levels. The EPA and Ecology found the proposal was reasonable however the monitoring well network will be reevaluated by EPA and Ecology following construction to determine whether current wells remain sufficient or if additional wells need to be added to the network.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy selection still valid?

Question B Summary:

The ROD included the following RAOs: ensure containment is effective and working; ensure containment will be maintained; return groundwater to drinking water standards and state cleanup standards downgradient of the

landfill boundary; and ensure no residential exposure to groundwater until groundwater cleanup standards have been met.

Containment generally appears effective and maintained, with the exceptions discussed above under Question A. Groundwater concentrations are still above drinking water standards for some contaminants but have declined from historical levels (except for upgradient concentrations of TCE and PCE, which are not site COCs). Two residential wells were found near the Site during the well survey, both of which are downgradient of monitoring wells where 1,4-dioxane concentrations exceeded regulatory standards in site monitoring wells.[4] The City plans to offer to sample these wells for 1,4-dioxane.

An Applicable or Relevant and Appropriate Requirement (ARARs) evaluation was conducted as part of this FYR to determine whether any ARARs have changed (Appendix I). As noted in previous FYR reports, the current state standard for vinyl chloride is less stringent than the cleanup goal selected in the ROD. The current state standard for manganese is more stringent than the cleanup goal selected in the ROD, and downgradient wells have concentrations of manganese that exceed the current state standard. Table 10 shows the COCs with ARAR changes. EPA and Ecology will determine if the vinyl chloride and manganese cleanup goals should be changed to reflect current standards.

Table 10: Groundwater COC - ARARs Review

Groundwater COC	2000 ROD Cleanup Goal	Basis	Current Standard[a]	ARAR Change
Vinyl chloride	0.02 µg/L	MTCA Method B	0.029 µg/L[b]	Less stringent
Manganese	2.2 mg/L	MTCA Method B	0.75 mg/L	More stringent

Notes:

a. Current standards accessed at: https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations and https://www.ezview.wa.gov/Portals/_1987/Documents/Documents/CLARC_Master.pdf.

b. More stringent MTCA Method B value used between the cancer and noncancer cleanup levels.

On several occasions, the detection limit for vinyl chloride data exceeded the ROD cleanup goal of 0.02 µg/L. While the 2000 ROD indicated that the PQL of 0.2 µg/L would be used to determine compliance with this cleanup goal because the cleanup goal is lower than the PQL, data from this FYR period indicate that in some cases, a detection limit of 0.02 µg/L was achieved. EPA and Ecology will determine an appropriate standard with which to evaluate vinyl chloride data.

The vapor intrusion exposure pathway was considered during this FYR. There were no detections of VOCs in the Upper Gravel Aquifer during this FYR period. The Upper Gravel Aquifer was the shallowest aquifer sampled during this FYR period. While VOCs above cleanup goals or regulatory standards are present in the Sand Aquifer and the Southern Gravel Aquifer, vapor intrusion is generally only considered for the top aquifer.

QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

[4] One well is in the Southern Gravel Aquifer. The other well is in the Alluvial Aquifer. The Southern Gravel Aquifer discharges to the Alluvial Aquifer east of the landfill.

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the FYR:
None.

Issues and Recommendations Identified in the FYR:

OU(s): Sitewide	Issue Category: Monitoring			
	Issue: The ROD cleanup goals for vinyl chloride and manganese do not reflect current ARARs.			
	Recommendation: Determine whether cleanup goal changes are needed for vinyl chloride and manganese.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA/State	EPA/State	9/23/2022

OU(s): Sitewide	Issue Category: Monitoring			
	Issue: 1,4-Dioxane has been found near the Site. The EPA is still assessing whether 1,4-dioxane is a site-related COC.			
	Recommendation: Complete assessment of whether 1,4-dioxane is a site-related COC and determine appropriate actions to address 1,4-dioxane if needed.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA/State	EPA/State	9/23/2022

OU(s): Sitewide	Issue Category: Monitoring			
	Issue: In the Southern Gravel Aquifer, vinyl chloride exceeded the cleanup goal by an order of magnitude in the most downgradient wells sampled, indicating the extent of vinyl chloride may not be fully delineated.			
	Recommendation: Delineate extent of vinyl chloride groundwater contamination in the Southern Gravel Aquifer.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	9/23/2022

OU(s): Sitewide	Issue Category: Monitoring
	Issue: The detection limit for vinyl chloride groundwater data exceeded the ROD cleanup goal of 0.02 µg/L on several occasions. While the 2000 ROD indicated that the PQL of 0.2 µg/L would be used to determine compliance with the cleanup goal because the cleanup goal is lower than the PQL, data from this FYR period indicate that in some cases, a detection limit at the cleanup goal was achieved.

	Recommendation: Determine an appropriate standard with which to evaluate vinyl chloride data.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA/State	EPA/State	9/23/2022

OU(s): Sitewide	**Issue Category: Institutional Controls**			
	Issue: There are private wells that are in use or potentially in use and downgradient or cross-gradient of the Site. One domestic well was installed in 2016 within the groundwater quality notification area.			
	Recommendation: Determine whether modifications to the groundwater quality notification system are needed to ensure wells are not constructed and used in areas with groundwater contamination.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	EPA/State	EPA/State	9/23/2022

OU(s): Sitewide	**Issue Category: Changed Site Conditions**			
	Issue: Downgradient or cross-gradient of the Site, the well survey identified six wells that are in use or potentially in use. Of these, two are domestic wells for drinking water, and four are irrigation wells. It is unknown whether these wells have site-related COC or 1,4-dioxane contamination.			
	Recommendation: Notify well owners of area groundwater contamination. Sample private wells for site-related COCs and 1,4-dioxane.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
Yes	Yes	PRP	State	9/23/2021

OTHER FINDINGS

Two additional recommendations were identified during the FYR. These recommendations do not affect current and/or future protectiveness.

- During the site inspection, there was evidence that moles had dug into the cap in some areas, and there were a few areas of settlement and ponding on the cap. Issues on the cap should be addressed.
- SPU submitted the Remedial Action Status Report (2015-2019) in July 2020. However, in order to support EPA's FYR, future Five-Year reports should be submitted the year in advance of the FYR, or annual reports should be submitted for annual review.
- Ensure site repository is updated with appropriate site documents.

VII. PROTECTIVENESS STATEMENT

Sitewide Protectiveness Statement	
Protectiveness Determination: Protectiveness Deferred	*Planned Addendum Completion Date:* 9/23/2021
Protectiveness Statement: A protectiveness determination of the remedy at the Site cannot be made at this time until further information is obtained. Further information will be obtained by: Notifying well owners of area groundwater contamination and sampling private wells for site-related COCs and 1,4-dioxane. It is expected that these actions will take approximately one year to complete, at which time a protectiveness determination will be made.	

VIII. NEXT REVIEW

The next FYR Report for the Midway Landfill Superfund site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

Consent Decree, Midway Landfill, Kent, Washington. State of Washington, Department of Ecology vs. City of Seattle. June 1990.

Declaration of Restrictive Covenant, Midway Landfill Superfund Site, Kent, Washington. City of Seattle and Washington State Department of Ecology. July 2005.

Five Year Review, Midway Landfill Superfund Site, Kent, Washington. Washington State Department of Ecology. September 2005.

Five Year Review, Midway Landfill Superfund Site, Kent, Washington. EPA Region 10. September 2010.

Five Year Review, Midway Landfill Superfund Site, Kent, Washington. EPA Region 10. September 2015.

Hydrogeologic Assessment for Compliance of 1,4-Dioxane, Midway Landfill Superfund Site, Kent, Washington. Seattle Public Utilities. October 2019.

Preliminary Close Out Report, Midway Landfill Superfund Site, Kent, Washington. EPA Region 10. September 2000.

Record of Decision, Midway Landfill Superfund Site, Kent, Washington. EPA Region 10. September 2000.

Remedial Action Status Report 2015-2019. Midway Landfill. Prepared by Parametrix, Seattle, Washington. July 2020

Remedial Investigation, Midway Landfill Superfund Site, Kent, Washington. City of Seattle, Department of Engineering, Solid Waste Utility. July 1988.

APPENDIX B – SITE CHRONOLOGY

Table B-1: Site Chronology

Event	Date
A gravel pit operated on site	1945-1966
The City leased the Site for use as a landfill	1966-1983
Seattle-King County Department of Public Health started administering a State-mandated screening process to eliminate the further disposal of hazardous waste at the Site	1980
The City closed the landfill	1983
Methane gas discovered in surrounding residential area	1984
EPA proposed Site for listing on the NPL	October 1984
Ecology began the RI/FS	March 28, 1985
The City began removal action to extract migrating landfill gases	September 1985
EPA placed Site on the NPL	May 1986
Ecology completed the RI/FS	October 3, 1986
The City began construction of the stormwater detention pond	August 1988
The City and Ecology signed Response Order on Consent	September 1988
The City completed construction of stormwater detention pond	June 1989
The City began construction of the final landfill cover	October 1989
Ecology and the City entered into Consent Decree	May 1990
The City completed construction of gas migration control system	March 1991
The City completed construction of landfill cover	May 1991
EPA issued Site's ROD	September 6, 2000
EPA signed Site's Preliminary Close-Out Report and deemed the Site construction complete	September 21, 2000
EPA completed Site's first FYR Report	September 28, 2005
EPA completed Site's second FYR Report	September 15, 2010
EPA completed Site's second FYR Addendum	January 7, 2013
EPA completed Site's third FYR Report	September 23, 2015
SPU contractor Parametrix completed a 1,4-dioxane hydrogeological assessment	October 2019
Construction for WSDOT and Sound Transit I-5 Corridor transportation projects began	2020

APPENDIX C – SITE HYDROGEOLOGY

Groundwater movement within and below the landfill has been characterized to an approximate depth of 300 to 350 feet below ground surface (50 to 100 feet above mean sea level). Several groundwater units have been identified within this interval. From shallowest to deepest these aquifers are: Perched Aquifer; Landfill Aquifer; Upper Gravel Aquifer; Sand Aquifer; and Northern Gravel and Southern Gravel Aquifer.

Perched Aquifer (also referred to as Shallow Groundwater)
The Perched Aquifer was named during the RI when it was believed to represent shallow, discontinuous lenses of groundwater perched on low permeability deposits above the Upper Gravel Aquifer. Field work and data analysis since completion of the RI indicate that while this groundwater is shallow and discontinuous, it is not always perched. Most of these shallow zones are found north of the landfill. The Perched Aquifer is referred to as Shallow Groundwater in some site reports.

Landfill Aquifer (also referred to as Saturated Refuse)
The Saturated Refuse consists of leachate within the landfill. Its occurrence and movement are largely the result of the former gravel pit topography. Flow in the Saturated Refuse is generally from the north and west toward the south-central section of the landfill, where the pit excavations were deepest. Leachate likely discharges vertically throughout much of the landfill base, but the greatest volume of vertical flow is in the south-central area. Leachate discharging from the landfill enters the underlying Upper Gravel Aquifer.

Upper Gravel Aquifer
The Upper Gravel Aquifer occurs immediately below the base of the landfill, is limited in lateral extent, and is composed of silty and sandy gravel. The aquifer is typically semi-confined, although some parts are unconfined. Groundwater flow in the Upper Gravel Aquifer is generally from both the north and south inward toward an area beneath the southern end of the landfill where the groundwater appears to discharge downward into the underlying Sand Aquifer. The Upper Gravel Aquifer and Sand Aquifer are separated by the Upper Silt Aquitard, a discontinuous layer of fine-grained silt, clayey silt, and silty fine sand. Vertical flow from the Upper Gravel Aquifer into the Sand Aquifer is most pronounced in places where the aquitard is absent.

Sand Aquifer
The Sand Aquifer occurs as a widespread deposit of interbedded sands and silts. Flow in this aquifer in the vicinity of the landfill is generally from the north and west to the southeast toward an apparent hydraulic sink. The sink occurs across a broad area beneath the southern part of the landfill and extends several hundred feet to the east. Groundwater south of this sink also flows towards the sink. Groundwater entering this sink appears to flow downward into the Southern Gravel Aquifer. Some vertical flow outside the sink area also occurs from the Sand Aquifer downward into the Southern Gravel Aquifer and Northern Gravel Aquifer.

Southern Gravel Aquifer
The Sand Aquifer and Southern Gravel Aquifer are separated by the Lower Silt Aquitard. Like the Upper Silt Aquitard, the Lower Silt Aquitard is discontinuous and likely controls downward flow from the Sand Aquifer into the Southern Gravel Aquifer. The deepest stratigraphic units studied are the Northern Gravel Aquifer and Southern Gravel Aquifer; they occur at about the same elevation, but hydraulic heads in the Northern Gravel Aquifer are typically 100 feet higher than heads in the Southern Gravel Aquifer. The Southern Gravel Aquifer is found beneath the southern half of the landfill and extends to the east, south and west. It consists of permeable sands and gravel interbedded with silts and silty gravel. The Southern Gravel Aquifer appears to be recharged by the Sand Aquifer and by lateral flow from the south. A groundwater mound in the Southern Gravel Aquifer, below the hydraulic sink in the Sand Aquifer, is believed to be an expression of flow through the sink. Groundwater flow has changed slightly since the RI, with a more northeast/northwest direction instead of east/west. Flow to the north is blocked by higher potentiometric heads within the Northern Gravel Aquifer. Groundwater in the Southern Gravel Aquifer eventually discharges west to Puget Sound and east to the Green River Valley.

Northern Gravel Aquifer

The Northern Gravel Aquifer is found beneath the northern half of the landfill and extends to the north and northeast. Like the Southern Gravel Aquifer, the Northern Gravel Aquifer consists of permeable sands and gravel interbedded with silts and silty gravel. Flow from the Northern Gravel Aquifer is generally from north to south toward the Southern Gravel Aquifer. Like the Southern Gravel Aquifer, the Northern Gravel Aquifer eventually discharges to Puget Sound and the Green River Valley.

APPENDIX D – 2005 DECLARATION OF RESTRICTIVE COVENANT

After Recording Return to:

City of Seattle
Seattle Public Utilities
Real Estate Services
700 5th Ave., Suite 4900
PO Box 34018
Seattle, WA 98124-4018

DECLARATION OF RESTRICTIVE COVENANT
MTCA USE RESTRICTIONS (WAC 173-340-440)

CITY OF SEATTLE MIDWAY LANDFILL
LOCATED IN KENT, WASHINGTON

Grantor(s): City of Seattle, a Washington Municipal Corporation

Regulatory Agencies: Washington State Department of Ecology

Abbreviated Legal Description of Property: Portions of real property located in the northeast and southeast quarters of Section 21 of Township 22 North, Range 4 East and a portion of the northwest quarter of Section 22 of Township 22 North, Range 4 East, City of Kent, King County, Washington

X Additional legal description in Exhibit A on pages 5 to 6 of document

Auditor's Reference Number(s) of documents assigned/released/amended: N/A

Assessor's Property Tax Parcel/Account Numbers:

222204-9168-03; 212204-9025-07; 212204-9014-00; 2122-9033-07 (portion); 212204-9026-06; 212204-9033-07 (portion); 212204-9137-02; and 212204-9021-01.

DECLARATION OF RESTRICTIVE COVENANT
CITY OF SEATTLE – MIDWAY LANDFILL SITE

This Declaration of Restrictive Covenant is made pursuant to RCW 70.105D.030(1)(f) and (g) and WAC 173-134-440, by the City of Seattle, its successors and assigns, and concerns the Midway Landfill Property located in Kent, Washington, owned in fee simple by the City of Seattle.

1. PROPERTY DESCRIPTION

The undersigned, City of Seattle ("Seattle"), is the fee owner of real property in King County, hereinafter referred to as the "Property." The Property is legally described in Exhibit "A" of this Restrictive Covenant and made a part hereof by reference. For the purposes of this Restrictive Covenant, the Property refers to the former Midway Landfill, located west of Interstate 5 and east of Pacific Highway South (Highway 99) at South 248th Street in the City of Kent, King County, Washington.

The Property has been used as a municipal landfill. This Property was listed on the National Priorities List of hazardous waste sites (Superfund) maintained by the United States Environmental Protection Agency. The Property has been the subject of remedial action under Federal and State environmental cleanup laws, including Chapter 70.105D RCW. Seattle makes the following declaration as to limitations, restrictions, and uses as to which the Property may be put, and specifies that such declarations shall constitute covenants running with the land, as provided by law, and shall be binding on all parties and all persons claiming under them.

2. DECLARATION OF RESTRICTIVE COVENANT

This Declaration of Restrictive Covenant is made by the City pursuant to the Washington State Model Toxics Control Act (MTCA), RCW 70.105D.030(1)(f) and (g) and WAC 173-340-440, as required by the State of Washington Department of Ecology, including any successor agency (hereafter referred to as "Ecology").

2.1 Remedial Action. The remedial action work done to clean up the Property (hereinafter the "Cleanup Action") is described in the Record of Decision (hereinafter the "ROD") for the Midway Landfill dated September 6, 2000 and in the Consent Decree with the Department of Ecology filed under King County, Washington, Superior Court Cause No. 90-2-13283-8 SEA. A copy of the ROD is attached to this Restrictive Covenant as Exhibit "B." Copies of these documents and documents describing the Cleanup Action conducted at the Property are on file at Ecology's Northwest Regional Office, 3190 – 160th Ave. SE, Bellevue, WA. Copies of the ROD, Consent Decree and Consent Decree Amendments are also on file in King County Superior Court, Seattle, WA, under Cause No. 90-2-13283-8 SEA.

2.2 Purpose of the Restrictive Covenant. This Restrictive Covenant is required by WAC 173-340-440 to assure the continued integrity of the Cleanup Action and provide notice.

2.3 Restrictions on Use. The City makes the following declaration as to limitations, restrictions, and uses to which the Property may be put and specifies that such declarations shall constitute covenants to run with the land, as provided by law, and shall be binding on all parties and all persons claiming under the City, including all current and future owners of any portion of or interest in the Property:

2.3.1 Any activity on the Property that may interfere with the Cleanup Action as defined in the ROD, is prohibited. Any future use of the Property shall not disturb the integrity of the final cover, or any other components of the containment system. Any future use of the Property shall not disturb, damage, or alter any component of the landfill gas extraction system, or any of its attendant monitoring probes or wells except as approved in writing by the Department of Ecology or its successor agency. Any activity on the Property that may result in the release of a hazardous substance that was contained as part of the Cleanup Action is prohibited. Any activity on the Property that may result in endangerment to human health or the environment by hazardous substances contained on Property or by gas generated by and emitted from the Property is prohibited.

2.3.2 Except for groundwater monitoring, no groundwater may be taken for any purpose from any well on the Property without Department of Ecology ("Ecology") approval. No water supply wells may be installed on the Property.

2.3.3 City must give thirty (30) days advance written notice to Ecology of the City's intent to convey any interest in the Property. No conveyance of title, easement, lease, or other interest in the Property shall be consummated by the City without adequate provision for continued monitoring, operation and maintenance of the Cleanup Action.

2.3.4 City must restrict leases to uses and activities consistent with this Restrictive Covenant and notify all lessees of the restrictions on the use of the Property.

2.3.5 City must notify and obtain approval from Ecology prior to any use of the Property that is inconsistent with the terms of this Restrictive Covenant. Ecology may approve any inconsistent use only after public notice and comment.

2.3.6 The City shall allow authorized representatives of Ecology the right to enter the Property at reasonable times and with reasonable prior notice for the purpose of evaluating compliance with the Cleanup Action and to inspect records that are related to the Cleanup Action.

2.3.7 The City reserves the right under WAC 173-340-440 to record an instrument that provides that this Restrictive Covenant shall no longer limit use of the Property or be of any further force or effect. However, such an instrument may be recorded only if Ecology, after public notice and opportunity for comment, concurs.

THE CITY OF SEATTLE:

Chuck Clarke
Seattle Public Utilities

7/12/05
Date Signed

STATE OF WASHINGTON)
) ss.
COUNTY OF KING)

On this 12 day of July, 2005, before me, the undersigned, a Notary Public in and for the State of Washington, duly commissioned and sworn, personally appeared Chuck Clarke, known to me know to be the Director of SEATTLE PUBLIC UTILITIES, the entity that executed the within and foregoing instrument, and acknowledged the said instrument to be the free and voluntary act and deed of said entity, for the uses and purposes therein mentioned, and on oath state that he is authorized to execute the said instrument and that the seal affixed (if any) is the seal of such entity.

WITNESS my hand and official seal affixed the day and year in this certificate above written.

EFFIE K. MOODY NOTARY PUBLIC STATE OF WASHINGTON COMMISSION EXPIRES APRIL 26, 2007

NOTARY PUBLIC in and for the State of Washington, residing at Silverdale WA

My commission expires 4-26-2007

Exhibit "A"

MIDWAY LANDFILL LEGAL DESCRIPTION

PARCEL A: Tax lot # 222204-9168-03

That portion of the west half of the southwest quarter of the northwest quarter of Section 22, Township 22 North, Range 4 East, W.M., in King County, Washington, lying westerly of the Primary State Highway Number #1, (Interstate Highway No. 5) as condemned in King County Superior Court Cause No. 535009, and between the north and south lines of the south half of the north half of the southeast quarter of the northeast quarter of Section 21, Township 22 North, Range 4 East, W.M., in King County, Washington, extending easterly to the west margin of Primary Sate Highway #1.

PARCEL B: Tax lot # 212204-9025-07, and # 212204-9014-00, and a portion of # 212204-9033-07

The south half of the southeast quarter of the northeast quarter and the west half of the west half of the northeast quarter of the southeast quarter of Section 21, Township 22 North, Range 4 East, W.M., in King County, Washington, lying westerly of Primary State Highway Number 1 (Interstate Highway No. 5);

EXCEPT that portion described as follows:
Beginning at the southwest corner of the southeast quarter of the northeast quarter of said section;
thence north 01°07'09" east 363.64 feet along the west line of said subdivision;
thence south 87°53'39" east 602.44 feet ;
thence south 01°07'09" west 202.70 feet ;
thence south 81°19'39" west 447.99 feet ;
thence south 39°19'39" west 260.00 feet to the west line of the northeast quarter of the southeast quarter of said Section;
thence north 01°05'25" east 130.03 feet along said west line to the point of beginning;
AND EXCEPT that portion of the north half of the southwest quarter of the southeast quarter of the northeast quarter of said Section 21, lying north of the south 40 feet and west of the east 60 feet .
AND EXCEPT the north 100 feet of the south 130 feet of the west 95 feet of the west half of the west half of the northeast quarter of the southeast quarter, of said Section 21;
AND EXCEPT the south 30 feet thereof for South 252nd Street.

PARCEL C: Tax lot # 212204-9026-06

Those portions of the southeast quarter of the northeast quarter and the northeast quarter of the southeast quarter of Section 21, Township 22 North, Range 4 East, W.M., in King County, Washington, more particularly described as follows:

Beginning at the southwest corner of the southeast quarter of the northeast quarter of said section; thence north 01°07'09" east 363.64 feet along the west line of said subdivision;
thence south 87°53'39" east 602.44 feet;
thence south 01°07'09" west 202.70 feet;
thence south 81°19'39" west 447.99 feet;
thence south 39°19'39" west 260.00 feet to the west line of the northeast quarter of the southeast quarter of said section;
thence north 01°05'25" east 130.03 feet along said west line to the point of beginning;
EXCEPT that portion, if any, lying north of the south 40 feet and west of the east 60 feet of the north half of the southwest quarter of the southeast quarter of the northeast quarter of said Section 21.

PARCEL D: Tax lot # 212204-9033-07 (portion)

The north 535.83 feet of the northeast quarter of the southeast quarter of Section 21, Township 22 North, Range 4 East, W.M., in King County, Washington, lying westerly of Primary State Highway Number 1 (Interstate Highway No. 5);

EXCEPT that portion within the west half of the northwest quarter of the northeast quarter of the southeast quarter of said Section 21.

SOUTHEAST PARCEL: Tax Lot #2122049137-02

That portion of the NE ¼ of the SE ¼ of Section 21, Township 22 North, Range 4 East, W. M., in King County, Washington, described as follows:

Beginning at the NE corner of the above described subdivision; thence South along the East section line of said Section 21, 535.83 feet to the True point of Beginning; thence West parallel with the South line of said subdivision 987.6 feet to the East line of the West ¼ of the NE ¼ of the SE ¼; thence South along said East line 780 feet to the South line of said subdivision; thence East along said South line 987.6 feet to the SE corner of said subdivision; thence North along said Section line 780 feet to the True Point of Beginning;

EXCEPT that portion lying within Primary State Highway Number #1 (Interstate Highway No. 5); and
EXCEPT that portion lying within South 252nd Street.

NORTH PARCEL: Tax Lot # 2122049021-01

Beginning at the southeast corner of the south half of the north half of the southeast quarter of the northeast quarter of Section 21, Township 22 North, Range 4 East, W.M., in King County, Washington;

Thence north 89°41'00" west along the south line of said south half of the north half of the southeast quarter of the northeast quarter 1318.90 feet to the southwest corner thereof;
Thence continuing north 89°41'00" west along the prolongation of said south line 79.98 feet, more or less, to an intersection with the easterly line of State Road Number 1 (Highway 99);
Thence north 08°54'00" east along said easterly line of State Road Number 1, 327.02 feet to a point where said easterly line of State Road Number 1 is intersected by the westerly prolongation of said north line of said south half of the north half of the southeast quarter of the northeast quarter;
Thence south 89°49'07" east along said westerly prolongation of said north line 25.91 feet, more or less, to the northwest corner of said south half of the north half of the southeast quarter of the northeast quarter;
Thence continuing south 89°49'07" east along the said north line 1319.25 feet to the northeast corner of said south half of the north half of the southeast quarter of the northeast quarter;
Thence south 00°28'18" east along the east line thereof 326.72 feet to the point of beginning;
EXCEPT the westerly 250 feet (as measured along the north line of said property), and parallel to the east line of State Road Number 1 (Highway 99).

Exhibit "B"

RECORD OF DECISION (ROD) FOR THE MIDWAY LANDFILL

[Attached]

Declaration

SITE NAME AND LOCATION

Midway Landfill
Kent, Washington

CERCLIS Identification Number: WAD 980638910

STATEMENT OF BASIS AND PURPOSE

This Decision Document presents the selected remedy for the Midway Landfill site, located in the City of Kent, King County, Washington. This Record of Decision (ROD) has been developed in accordance with the requirements of Comprehensive Environmental, Response, Compensation, and Liability Act (CERCLA) of 1980, 42 USC §9601 *et seq.* (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300. This decision is based on the Administrative Record for the Site.

The remedy was selected by the U.S. Environmental Protection Agency. The State of Washington concurs with the selected remedy.

ASSESSMENT OF THE SITE

The response action selected in this Record of Decision (ROD) is necessary to protect the public health or welfare or the environment from an actual or threatened release of hazardous substances into the environment. Such a release or threat of release may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The selected remedy for the Midway Landfill site consists of:

1. Monitoring to:
   a) ensure the remedial systems are working as designed,
   b) ensure progress is being made towards meeting the groundwater cleanup standards,
   c) ensure adequate containment is maintained when and if major changes are approved by Ecology in the operation of the site, and
   d) demonstrate that the cleanup levels have been achieved.

Monitoring includes, but is not limited to, groundwater monitoring and landfill gas monitoring.

2. Continuing to operate and maintain all remedial project elements required in the Ecology/City of Seattle 1990 consent decree, including the gas collection system, the multilayered cap, and the storm water collection system.

3. Implementing institutional controls. Three types of institutional controls are included in the selected remedy: permanent notices in King County's real estate records, assurances in the 1990 consent decree that operation and maintenance of the containment and monitoring systems will continue if the ownership or control of the property should change; and annual notices to appropriate agencies, water districts and locally active well drillers so that no water supply wells are constructed or used in areas with groundwater contamination from the landfill.

This ROD also establishes cleanup levels for the groundwater down gradient from the landfill.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate for the remedial action, is cost-effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

The remedy selected in this ROD does satisfy the statutory preference for treatment as a principal element of the remedy. Extracted landfill gas is flared as part of the existing landfill gas collection system.

Because this remedy will result in hazardous substances remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted under CERCLA within five years of this Record of Decision to ensure that the remedy continues to

be protective of human health and the environment.

DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record file for this site.

Chemicals of concern (COCs) and their respective concentrations. (See Section 5.)

A baseline risk assessment for current conditions at the landfill was not prepared because the contaminants of concern, migration routes, and the risks to human health and the environment were characterized in RI/FS reports completed in 1990. However, there is a need for action because groundwater downgradient from the landfill still contains contaminants of concern above federal drinking water standards (MCLs.) (See Section 7.)

Cleanup levels established for COCs and the basis for these levels. (See Section 8.)

How the source materials constituting principal threats are addressed. Source materials constituting principal threats have not been identified at Midway Landfill. (See Section 4.)

Current and reasonably anticipated future land and groundwater use assumptions used in the ROD. (See Section 6.)

Potential land uses that will be available at the site as a result of the selected remedy. (See Sections 6 and 11.3.)

Annual cost estimates for the selected remedy. (See Section 11.2.)

Key factors that led to selecting the remedy. (See Section 11.1)

Charles E. Findley
Acting Regional Administrator, Region 10
United States Environmental Protection Agency

9-6-00
Date

Decision Summary

Midway Landfill
Kent, Washington

1. Site Name, Location, and Description

The Midway Landfill is located between Interstate-5 (I-5) and Highway 99, and between S. 252nd Street and S. 246th Street in Kent, Washington, directly east of the city of Des Moines. (Figure 1-1.) The landfill is approximately 60 acres in size with refuse buried on about 40 acres and at depths over 100 feet. From 1966 to 1983, approximately three million cubic yards of solid waste were deposited at the Midway Landfill. The landfill is now owned by the City of Seattle.

Because of the remedial work performed by the City of Seattle since 1985, environmental conditions have greatly improved. The landfill is now covered with a multilayered engineered cap, with a top layer of grass. The landfill is fenced and access is limited. A gas extraction system is in place and operating throughout the landfill. Because of these actions, potentially explosive landfill gas does not leave the landfill property and the quality of the groundwater leaving the landfill has greatly improved. The city's estimate of closure costs amounted to about $56.5 million as of 1995.

Land use in the landfill vicinity consists primarily of commercial activities and residential areas. Commercial establishments and light industry and manufacturing border both sides of Highway 99 in the area. Two elementary schools, Sunnycrest Elementary School and Parkside Elementary School, and a city park, Linda Heights Park, are within a half-mile radius of the site. Most of the nearby residences are detached single-family dwellings, with some multi-unit residential developments to the south and west. Several mobile home parks are also in the vicinity. A six-acre wetland, the Parkside Wetland, located to the east of the Parkside Elementary School and west of the landfill is a naturally occurring detention basin for local surface water runoff, primarily from the west side of Highway 99.

There are no wetlands, flood plains, rare, threatened or endangered species, or sites on or eligible for the National Registry of Historic places at the site. Storm water from the site drains into McSorley Creek, which is a salmon-bearing stream containing coho and chum salmon, steelhead and cutthroat trout. Coho salmon is a candidate for listing under the Endangered Species Act.

The State of Washington Department of Ecology (Ecology) has been the lead regulatory agency for the cleanup work at Midway Landfill since the mid-1980's. While the U.S. Environmental Protection Agency (EPA) has prepared and released a proposed plan and this

ROD, EPA expects Ecology to continue to be the lead cleanup regulatory agency overseeing this remedial action. The work has been, and will continue to be, conducted by the City of Seattle.

2. Site History and Enforcement Activities

2.1. Site History through the 1990 Consent Decree.

From 1945 to 1966, the site of the current Midway Landfill was operated as a gravel pit. Originally, the pit was adjacent to a natural drainage basin often used as a settling pond. This basin, known as Lake Meade, was located northeast from the center of the present landfill. As the pit was mined, water was drawn from Lake Meade to wash silt and clay from the gravel and sand, and then returned to the lake. This silt and clay settled on the lake bottom. Near the end of the gravel pit operation, the lake was drained into the southern end of the gravel pit, depositing a layer of clay and silt into the bottom of the pit. This layer of fine materials currently underlies much, but not all, of the present landfill.

In 1966, the City of Seattle leased the site and began using it as a landfill. From 1966 to 1983, approximately three million cubic yards of solid waste were deposited there. The exact dimensions of the bottom of the landfill are not known. However, existing boreholes indicate that the solid waste extends as deep as 130 feet in some places.

The Midway Landfill was created primarily to accept demolition materials, wood waste and other slowly decomposing materials. However, some hazardous wastes and industrial wastes, including approximately two million gallons of bulk industrial liquids from a single source, were also placed in the landfill. In 1980, a state-mandated screening process administered by the Seattle-King County Department of Public Health was initiated to eliminate the disposal of any hazardous waste into Midway Landfill.

When the City closed the landfill in the fall of 1983, it began extensive testing of water and gas in the landfill and its vicinity. Samples of groundwater from monitoring wells in and around the landfill, and gas samples from gas probes, indicated the presence of organic and inorganic contaminants outside the landfill boundary. In 1985, Ecology also began investigating the site and found methane gas in nearby residences. Beginning in September 1985, the City of Seattle constructed gas migration control wells within the landfill property and gas extraction wells beyond the landfill property to control the subsurface migration of gas. Gas was found to have migrated up to 2600 feet beyond the landfill prior to installation of the gas extraction system.

In October 1984, Midway Landfill was nominated for inclusion on the federal National Priorities List (NPL) based on potential groundwater contamination. Following that nomination, Ecology was designated as the lead agency for the Midway Landfill Superfund

action, pursuant to a Cooperative Agreement with EPA. In May 1986, Midway Landfill was placed on the NPL. In September 1988, the City of Seattle, which owns and had operated Midway Landfill, entered a Response Order on Consent with Ecology. This Response Order governed the preparation of a Remedial Investigation and a Remedial Action Feasibility Study (RI/FS) for the landfill.

In May 1990, prior to completion of the remedial investigation and feasibility studies, the City and Ecology entered into a consent decree pursuant to State of Washington Model Toxics Control Act (MTCA.) This legal agreement set forth Ecology's determination that undertaking certain remedial actions at Midway Landfill, prior to a Cleanup Action Plan (a MTCA decision document, similar to a Superfund ROD) would provide immediate protection to public health and the environment. In this consent decree, the City of Seattle agreed to finance and perform specific cleanup work. This cleanup work, or remedial action, had four elements:

- Construction of a landfill cover. The multi-layered Landfill Cover System ("cap") was to be comprised of layers (from bottom to top) of low permeability clayey silt/silty clay, a 50-mil synthetic membrane, a geonet drainage layer, one foot of sand and one foot of topsoil planted with shallow rooted grasses. The landfill cover was designed to greatly reduce the amount of rain that would seep into the landfill and to control the post-closure escape of hazardous emissions from the landfill.

- Completion of a gas extraction system, including a Final Gas Manifold System to link onsite extraction wells to an enhanced motor blower and flare system. The purpose of the onsite extraction wells was to create a "vacuum curtain" around the closed landfill to prevent offsite migration of landfill gas, and to help draw previously migrated gas back to the landfill. The enhanced flares were installed to burn the extracted gas before discharge to the atmosphere. The gas extraction system also included approximately 127 offsite gas monitoring probes to provide data on the extent of landfill gas migration and the effectiveness of the extraction system.

- Completion of a surface water management system. This system consisted of site filling and grading to control surface water drainage to prevent surface water from infiltrating the landfill, construction of a 10 million gallon storm water detention pond with a permanent dewatering system, a controlled discharge structure, and rerouting of storm water from surrounding areas to prevent it from entering the landfill. This rerouting was done by diverting the Linda Heights Park drain and surface water runoff from I-5 to the detention pond.

- Preparation of a comprehensive operation and maintenance manual incorporating both short-term and long-term operation and maintenance requirements for all remedial actions implemented at the landfill as part of the consent decree.

The consent decree also required the City to place a notice in the records of real property kept by the county auditor stating that the landfill was on the NPL, and serve a copy of the consent decree upon any prospective purchaser, lessee, transferee, assignee, or other successor in interest to the property prior to the transfer of any legal or equitable interest in all or any portion of the landfill.

2.2. Status of the work required by the 1990 Consent Decree

The City of Seattle completed construction of the landfill cover, landfill gas extraction system, and surface water management system in November 1992. Some of the other requirements of the consent decree have not yet been completed. As discussed in the following section, Ecology and the City of Seattle anticipate amending the 1990 consent decree after this ROD is signed.

Construction elements required by the 1990 Consent Decree

Landfill Gas Control - An active gas control system was installed at the Midway Landfill. It originally included 87 gas extraction wells, 31 of which were located off the landfill in native soil. The off-landfill wells have since been abandoned or capped. In addition, approximately 70 off-landfill gas monitoring probes were installed to provide information on gas concentrations; about half of these probes have since been abandoned. The gas is extracted through the control wells at the landfill and routed to a permanent blower/flare system. Construction of the gas migration control system began in September 1985 and was completed in March 1991.

Landfill surface filling and grading - The landfill surface was regraded which increased the soil cover over the landfill by 2 to 14 feet. The engineered grades improved surface water runoff and decreased infiltration. The fill was also compacted to reduce permeability and prepare the surface for the cover system. The work began in August 1988 and was competed in June 1989.

Storm Water Detention Pond Construction and Associated Dewatering and Discharge System- A lined detention pond was constructed to the north of the landfill. Regrading of the landfill surface redirected surface water, which previously infiltrated into the landfill, to the new detention pond. The detention pond is a 3 acre structure, lined with a 60-millimeter high-density polyethylene membrane (HDPE) to eliminate infiltration. The bottom of the pond was constructed below localized groundwater; therefore, a permanent dewatering system was also installed. Construction of the storm water detention pond began in August 1988 and was completed in June 1989.

Landfill Cap Installation - Construction of the final landfill cover began in October 1989 and

was completed in May 1991. It consists of the following layers from bottom to top: a 12-inch thick layer of low permeability (1 x 10-7 cm/sec) soil/clay material; a 50 millimeter HDPE flexible membrane; drainage net; filter fabric; 12-inch-thick drainage layer; and a 12-inch-thick topsoil layer.

Linda Heights Park Storm Water Diversion - The Linda Heights Park drain, a 30-inch culvert that drained directly into the landfill, was blocked. Storm water is now routed through a pump station and a pipeline to the detention pond. The old discharge line to the landfill is still in place and functions as an overflow in the event of a pump station failure. The construction of this rerouting began in August 1989 and was completed in 1991. The pump station and associated diversion of storm water was activated in January 1992.

Non-construction elements required by the 1990 consent decree

Operation and maintenance (O&M) plan - A comprehensive operation and maintenance manual for both short-term and long-term operation and maintenance for the systems constructed under the consent decree was prepared by the City of Seattle, and was approved by Ecology in April 1992.

Deed notice - The deed notice required by the consent decree has not yet been placed on the property.

Monitoring and monitoring plan - Monitoring and a monitoring plan are not specifically identified as required activities in the 1990 consent decree. An amendment to the consent decree will specify a requirement to implement a compliance monitoring plan approved by Ecology, as well as to implement an operations and maintenance plan already required to be prepared under the 1990 consent decree. The City of Seattle and Ecology are still in negotiations on the long-term monitoring plan. Starting in late 1989, the City initiated performance and compliance monitoring programs at the landfill. Performance monitoring (which did not include chemical analysis) was intended to track the response of landfill leachate levels and shallow groundwater levels to the implementation actions required by the consent decree. Quarterly water quality monitoring began in 1990 to develop a database for water quality in selected groundwater monitoring wells. This monitoring program, which became the compliance monitoring program, was modified in 1993 and again in 1998 with concurrence from Ecology. Compliance monitoring was intended to track the presence, concentrations and migration of groundwater contaminants both up gradient and downgradient of the landfill, and to assess the effectiveness of the remedial action. Both monitoring programs are ongoing and sampling is presently conducted on a twice yearly basis. Landfill gas monitoring is conducted frequently; it consists of checks for concentration, composition, temperature, flow and velocity of gases in and around the landfill.

3. Community Participation

Because of the high degree of public interest in the landfill, the City of Seattle and the Washington State Department of Ecology first developed a formal community involvement program in 1985 when residents near the landfill became concerned about landfill gas migration. Public meetings were held at critical points to keep residents informed about activities at the landfill. Also, for about two years, the City ran an information office in the Midway area to give citizens a convenient place to find out about cleanup activities, health information, and legal claims. As landfill gas migration was brought under control and residents' fears subsided, office hours were reduced and eventually the office closed. During the same period, a newsletter was sent to about 7000 area residents. The City and Ecology also worked with leaders from local active community groups to set up MAG (Midway Action Group) meetings, which were held monthly at first, and then less frequently. Through these meetings, community members could express their views and learn about the investigation and cleanup process.

The City created the Good Neighbor Program in 1986 to help the community when concern over landfill gas was at its peak. The program addressed fears about perceived drops in property values. The City guaranteed residents that their homes would sell for fair market value, as if the landfill was not there. The City continued the program until the real estate market returned to normal.

Very few formal community participation activities took place in the 1990's, though Ecology and City of Seattle staff continued to be available to respond to concerns and questions from the public.

EPA's proposed plan was issued in May 2000 and the original public comment period ran from May 18 to June 16, 2000. Over 2,000 fact sheets summarizing the proposed plan were sent to all addresses and residents in the three postal carrier routes around the landfill. Additionally, the fact sheets were mailed to 48 other potentially interested parties (such as the Cities of Kent and Des Moines) outside the carrier route. Approximately two to three dozen copies of the proposed plan were sent out, and additional copies were available from EPA's Seattle office and at the City of Kent Regional Library. The fact sheet and proposed plan were also available on the Region 10 web page. Display notices were published in the Seattle Times, Seattle Edition on May 16, in the Seattle Times, South County Edition, on May 23, and in the South County Journal on May 17. The City of Seattle asked for an extension of the comment period on June 15, and the end of the public comment period was extended until July 17, 2000. Notices of the extension were published in the Seattle Times, South County Edition and the South County Journal on June 21.

The fact sheets, newspaper notices and the proposed plan offered to hold a public meeting if

sufficient interest was expressed by May 31, 2000. Only four requests for a meeting were received and thus a public meeting was not held. EPA staff called each person who requested a meeting to make sure he or she had all the information they wanted about the Midway Landfill and the proposed remedial decision.

Four comment letters on the proposed plan were received. EPA's response to these comments can be found in the attached Responsiveness Summary.

This decision is based on the administrative record. The Midway Landfill Administrative Record is located at the EPA Superfund Records Center, 1200 Sixth Avenue, Seattle, Washington, and in the Kent Regional Library, 212 2nd Avenue N, Kent, Washington.

4. Scope and Role of this Response Action

This ROD is the final CERCLA decision for the Midway Landfill site.
The City of Seattle's cleanup work, including the work done in response to the 1990 consent decree between the City and Ecology, has successfully reduced the environmental problems at the landfill. The selected remedy incorporates elements required in the 1990 consent decree between City and Ecology, and adds some elements to ensure long-term protectiveness of the remedy. The selected remedy also sets groundwater cleanup standards.

The Midway Landfill site has no "principal threat" wastes, as that phrase is defined in EPA guidance.

For the purposes of this ROD and potential future deletion of this site from EPA's National Priorities List, the Midway Landfill "site" is the landfill area containing waste, and all downgradient contaminated groundwater resulting from releases from the landfill. Several potential up gradient groundwater sources have been identified but are not included within the "site" and are not addressed by this ROD.

Ecology has separate responsibilities for decision-making at the Midway Landfill site under the State's Model Toxic Control Act (MTCA). Under MTCA, the decision document that selects the cleanup action and cleanup levels is called a Cleanup Action Plan. Ecology and the city had been working on a final Cleanup Action Plan for Midway Landfill for many years. When, in February 2000 it was determined that it was unlikely that such a Cleanup Action Plan could be completed in FY 2000, Ecology agreed that EPA could write a CERCLA ROD for the landfill so that a determination of CERCLA construction completion could be made. Ecology has decided to utilize the ROD as a Cleanup Action Plan for a final MTCA remedy, pursuant to WAC 173-340-360(13). This decision will be specified in an anticipated amendment to the 1990 consent decree.

Ecology has been the lead regulatory cleanup agency at the Midway Landfill site. EPA expects Ecology to continue in that capacity.

5. Site Characteristics and Nature and Extent of Contamination

5.1. Conceptual Site Model and Summary of Landfill Conditions

Because of the remedial work performed by the City of Seattle at Midway Landfill since 1985, the environmental conditions at the site have greatly improved.

- Potentially explosive methane gas does not leave the landfill property, and has not since 1990. The gas is collected within the landfill and then burned on the site. The gas collection system has also helped dry out the landfill contents and further reduce the contaminated groundwater leaving the landfill.
- Storm water no longer enters the landfill. The entire landfill is covered with an engineered cap. Clean storm water is collected from the entire surface of the landfill and the surrounding area and stored in a lined storm water detention pond north of the landfill before discharge to McSorley Creek.
- There are multiple layers of sand, or sand and gravel, under or around the landfill that allow subsurface movement of groundwater to and from the landfill. These layers, or aquifers are called, in order from the surface to the deepest layers studied: the Shallow Aquifer; Saturated Refuse and Landfill Leachate; the Upper Gravel Aquifer, the Sand Aquifer, and the Northern and Southern Gravel Aquifers.
- Water in the Shallow Aquifer, the Upper Gravel Aquifer and the Sand Aquifer moves from outside the landfill inward towards the south end of the Midway Landfill. This water, along with the leachate developed within the landfill itself, then joins the deeper Southern Gravel Aquifer. Water from the landfill does not appear to enter the Northern Gravel Aquifer.
- There is now significantly less water within the landfill because of the remedial actions described above. Many of the shallower monitoring wells in or near the landfill that used to contain contaminated groundwater are now dry. The water levels around the landfill in both the Upper Gravel Aquifer and the Sand Aquifer have also generally dropped. These results mean that much less water is entering the landfill and the containment systems constructed by the City of Seattle have been successful.
- The only downgradient monitoring wells where contamination has been detected over the past two or three years are in the Southern Gravel Aquifer. Two of these wells are located approximately 600 feet and 1200 feet east of the south-east corner of the landfill. Three chemicals, 1,2-dichloroethane, vinyl chloride, and manganese, have been detected at levels of concern. The two VOCs were detected at slightly above the federal drinking water standard. Manganese has also been detected at levels above background on the west side of the landfill in the Southern Gravel Aquifer.
- Another Southern Gravel Aquifer monitoring well that is closer to the landfill has met all federal drinking water standards for the past two years. Groundwater monitoring

conducted during the RI indicated that this same well had contaminants at levels greater than 10 times the federal drinking water standard. Again, these results indicate that the containment remedy appears to be successful.

- There is some groundwater contamination in the Sand Aquifer to the north, northwest and west of the landfill that did not come from Midway Landfill. Some of the groundwater samples in this area are above both federal and state drinking water standards and the MTCA cleanup standards. This contamination may be flowing towards and under the Midway Landfill. No one is using this groundwater and thus no one is currently exposed to this contamination.

The following sections provide more detailed summary information about the site characteristics, hydrogeology, and groundwater quality.

5.2. Geographic Description

The Midway Landfill is located near the crest of a narrow north-south trending glacier feature known as the Des Moines Drift Plain. This area, referred to as "upland" because of its location above adjacent valleys and sea level, is bordered by Puget Sound on the west and the Green River valley on the east. Maximum elevations along the crest of the upland generally range from 400 to 450 feet above mean sea level (MSL). Puget Sound is at sea level, and the Green River valley floor typically averages about 30 feet above MSL.

The Midway Landfill occupies a shallow, bowl-shaped depression near the crest of the upland. The surface of the landfill generally ranges from 360 to 400 feet above MSL and slopes upward to the south and east. West of the landfill, the land surface is nearly flat across Highway 99 and then drops steeply downward approximately 100 feet to the Parkside Wetland.

The upland area is cut with a number of steep-sided stream valleys. Midway Creek is located northeast of the landfill, and two other streams, the north and south forks of McSorley Creek, are located to the west and southwest, respectively.

There is no major surface water body in the immediate vicinity of the Midway Landfill. The closest are Lake Fenwick, located approximately one mile to the southeast, and Star Lake, located approximately 1.5 miles to the south.

5.3. Geology

Site geology and hydrogeology have had a major influence on the movement of contaminants in the vicinity of Midway Landfill, the impact of the completed remedial actions, and affect the selection of the cleanup remedy.

The Des Moines Drift Plain is part of the Puget Lowland that lies between the Olympic Mountains on the west and the Cascade Mountains on the east. The Puget Lowland is underlain by a thick sequence of Quaternary glacial, fluvial (riverine), and lacustrine (lake bed) deposits overlying Tertiary volcanic and sedimentary bedrock. Depth to bedrock is thought to exceed 1,000 feet near Midway Landfill. Deposits of at least four glaciations have been identified in the Puget Sound Lowland. The most recent glaciation, the Fraser, consisted of two stages: the Vashon (oldest) and Sumus (most recent).

Based on earlier studies of the area and analysis of geological samples collected during the installation of monitoring wells for the RI, nine stratigraphically distinct deposits were identified from the land surface down approximately 400 feet to sediments that are near current mean sea level. Because of the complex layering in all the sediments underlying the landfill, vertical and horizontal permeabilities are highly variable and produce a complex groundwater flow pattern.

5.4. Hydrogeology and Ground Water Quality

Groundwater movement within and below the landfill has been characterized to an approximate depth of 300 to 350 feet below ground surface (50 to 100 feet above mean sea level (MSL)). Several groundwater units have been identified within this interval. From shallowest to deepest these aquifers are: Shallow Groundwater; Saturated Refuse; Upper Gravel Aquifer (UGA); Sand Aquifer (SA); and Southern Gravel Aquifer (SGA) and Northern Gravel Aquifer (NGA) An east-west cross section is shown in Figure 5-1; the line of this cross-section is H-H' on Figure 5-2.

Between October 1986 and January 1990, a total of 56 groundwater monitoring wells were installed and sampled in 41 locations up gradient and downgradient of the Midway Landfill . (Many wells have multiple completions at the same location). Samples from these locations were analyzed for conventional water quality parameters and EPA's hazardous substance list, including metals, volatile organic compounds (VOCs), pesticides and other potentially hazardous substances. Hazardous substances detected in the groundwater included arsenic, manganese, benzene, 1,2-dichloroethane, vinyl chloride, and methylene chloride.

In addition, the extent of contaminant migration into the groundwater system beneath the landfill was estimated using specific chemicals as indicators of leachate movement within the aquifers. In particular, chloride concentrations in the landfill leachate were several hundred times greater than background groundwater concentrations. Therefore, elevated chloride was used to delineate the extent of the contaminant plume and as a conservative tracer of groundwater movement. The concentrations of manganese (a naturally-occurring metal that is often elevated downgradient of landfills) and certain chlorinated ethenes and ethanes in the groundwater were also used to confirm the extent of the plume.

A subset of the RI groundwater monitoring network has been used for monitoring the effects of the work required by the consent decree. Figure 5-3 shows the locations of the monitoring wells still used to monitor groundwater quality. Water levels are monitored in these and additional monitoring wells.

Of the hazardous substances identified during the RI, only manganese and two VOCs, 1,2-dichloroethane and vinyl chloride, are still considered groundwater contaminants of concern. None of the other hazardous substances have been detected in groundwater at levels approaching federal drinking water standards downgradient of the landfill for at least eight years.

The sections below summarize, by aquifer, the hydrogeology and groundwater quality information collected during the past 10 years as part of the groundwater monitoring program. For comparison, averaged contaminant concentration data (arithmetic mean) from the RI are also included. Nondetects were incorporated into these averages by using half the detection limit.

5.4.1. Shallow Groundwater

5.4.1.1. Shallow Groundwater Hydrogeology

This zone of saturation was described in the RI as shallow, discontinuous lenses of groundwater perched on low permeability deposits above the UGA. Field work and data analyses since completion of the RI indicate while the groundwater in this unit is shallow and discontinuous, it is not always perched above low permeability materials. The majority of these shallow zones are found north and south of the landfill. The general water elevation of the shallow groundwater zone adjacent to the landfill is generally at about 325 feet above MSL north and south of the landfill, and lower, and more discontinuous to the east and west (Figure 5-4).

The landfill's detention pond dewatering system affects shallow groundwater flow through areas along the northern periphery of the landfill. Shallow groundwater north of the landfill that exists at 320 feet or higher in elevation is captured by the pond's dewatering system and routed to North McSorley Creek. This system limits the capacity of the shallow groundwater to discharge into the landfill from the north; however, groundwater deeper than 320 feet in elevation can and does discharge into the landfill from the north. Shallow groundwater also occurs in disconnected zones south of the landfill at an elevation of approximately 325 feet, and discharges, at least seasonally, into the landfill.

5.4.1.1. Shallow Groundwater Water Quality

Shallow groundwater water quality has not been monitored as part of the performance and

compliance monitoring system. Shallow groundwater flows into the landfill.

5.4.2 Saturated Refuse and Landfill Leachate

5.4.2.1. Landfill Leachate Hydrogeology

Prior to the remediation required by the 1990 consent decree, the major sources of water to the landfill were: surface water infiltrating from the landfill surface and from areas north of the landfill that drained into the landfill; storm water discharge from the Linda Heights neighborhood, and I-5 drainage that was routed into the landfill as part of the construction of I-5; and shallow groundwater from north and south of the landfill. Refuse located below elevations of approximately 325 feet was generally saturated (Figure 5-5).

Flow in the refuse was generally from the north and west toward the south-central section of the landfill, where the pit excavations were deepest. Leachate may have discharged vertically throughout much of the landfill base, although the rate of discharge was affected by the fine-grained material deposited during gravel pit operations. Prior to remediation, the greatest volume of vertical flow was in the south-central area, where leachate discharged to the underlying Upper Gravel Aquifer.

Since construction of the engineered cap and storm water diversion systems, between 75 and 90 percent of the water that entered the landfill has been diverted and leachate levels have dropped by as much as 20 feet. This can be seen by comparing water elevations within the landfill in Figures 5-1 and 5-5, which corresponds to a 90 percent reduction in the amount of saturated refuse. The only remaining sources of water to the landfill are the shallow, discontinuous zones of groundwater north and south of the landfill. Water within the landfill now slowly evaporates into the gas system or leaks through the base of the landfill, approximately 100 to 150 feet below ground surface, into the underlying Upper Gravel Aquifer, described below.

5.4.2.2. Landfill Leachate Water Quality

Studies conducted during the RI established that most of the leachate from the landfill was aqueous. A small amount of floating light non-aqueous phase liquid (LNAPL) was also detected in the landfill. Dense non-aqueous phase liquid (DNAPL) has never been detected at the landfill.

Leachate samples were collected as part of the RI and analyzed for conventional water quality parameters and compounds on the EPA hazardous substance list. Results from these analyses and related monitoring indicated:

- The aqueous leachate contained aromatic and aliphatic hydrocarbons, dissolved salts, suspended particulates and low levels of VOCs and metals. Polynuclear aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs) were only detected in

groundwater samples in wells located adjacent to or in direct contact with NAPL pools.
- The LNAPL contained metals, VOCs including trans-1,2-dichloroethene and the BETX group (benzene, ethylbenzene, toluene and xylene), PAHs commonly detected in petroleum oil, and PCBs. PCB concentrations ranged from 107 ppm to 1,142 ppm.
- Some wells within the landfill had up to 20 feet of NAPL. Monitoring of wells outside the landfill did not detect any NAPL.
- A pumping program was tested as part of the 1990 FS to see if the LNAPL was extractable. Less than 100 gallons were extracted from the three wells with the greatest volume of NAPL; recharge into these wells was very slow.

Water quality in the landfill leachate has not been monitored as part of the performance monitoring system, though water depth and LNAPL have been. By 1998, of the approximately 18 wells monitored for oil thickness, approximately 13 had either no oil or only a trace of oil. The remaining 5 had oil measured between 0.27 feet and 3.96 feet.

5.4.3 The Upper Gravel Aquifer (UGA) and the Upper Silt Aquitard

5.4.3.1. Hydrogeology of the UGA and Upper Silt Aquitard

The Upper Gravel Aquifer consists of fifty to one hundred feet of outwash gravels that underlie the low permeability layer at the base of the landfill located 100 to 170 feet below ground surface. These gravels consist of interbedded zones of permeable gravels and less permeable mixtures of silt, sand, and gravels. Prior to construction of the actions required by the 1990 consent decree, discharge from the landfill resulted in significant areas of saturation within the UGA, especially in water-bearing strata at the base of the unit, where several monitoring wells were placed. (See, for example, Figure 5-5.)

Groundwater flow in the UGA is generally from both the north and south inward toward an area beneath the southern end of the landfill where the groundwater discharges downward into the underlying Sand Aquifer (SA). The UGA and SA are separated by the Upper Silt Aquitard, a discontinuous layer of fine-grained silt, clayey silt, and silty fine sand that is present throughout most of the study area. Vertical flow from the UGA into the SA is most pronounced in places where the aquitard is absent. One of these "windows" in the aquitard exists beneath the southern end of the landfill, where it allows the discharge from the UGA into the SA to occur. Discharge through this window was manifested as a distinct groundwater sink during the RI.

The construction of the remedial actions required by the 1990 consent decree and the subsequent dewatering of the refuse have greatly reduced the amount of recharge entering this unit. Groundwater continues to enter the UGA north and south of the landfill, and the groundwater and leachate continues to flow toward the sink beneath the southern part of the landfill.

However, the response of the UGA to changing conditions at the landfill was strong and rapid as indicated by the monitoring wells designed to monitor water quality conditions. Within the landfill footprint and around the perimeter, the UGA monitoring wells have been dry since 1992, even with rainfall that was significantly greater than average during the years from 1997 to 1999. Figure 5-6 shows the current potentiometric surface of the UGA. The sink still exists and appears to have "deepened" due to the loss of recharge from the landfill.

The UGA beneath the landfill is under vacuum from the landfill gas collection system. Any leachate leaking through the base of the landfill and infiltrating into this zone moves mostly by unsaturated flow and is directly exposed to the vacuum under conditions designed to strip volatile organics from the infiltrating water. This combination of predominately unsaturated conditions in the aquifer and the vacuum from the gas extraction system helps to contain volatile organics from being released to the underlying groundwater system.

5.4.3.2. Water Quality in the Upper Gravel Aquifer (UGA)

Prior to construction of the actions required by the 1990 consent decree, water quality in the water-bearing strata at the base of the unit, where several monitoring wells were placed, showed significant impacts from leachate. However, the RI concluded it was unlikely that contamination in the Upper Gravel Aquifer existed further than 100 to 200 feet from the landfill (in the south, west, and east direction) because of the strong component of downward flow in the aquifer into the underlying Sand Aquifer.

Following the remedial work required by the 1990 consent decree, the monitoring network in the UGA included two up gradient wells (MW-21A and MW-16) and two downgradient wells (MW-7A and MW-19B). The downgradient wells were located at points where the saturated refuse was believed to be discharging leachate downward into the UGA. However, the downgradient wells MW-7A and MW-19B have not been sampled since 1992 due to the declining groundwater levels in the UGA. In the two or so years prior to going dry, both wells had no detectable concentrations of any VOCs, except chlorobenzene at concentrations ranging from non-detected to 4 ppb (the federal drinking water standard or Maximum Contaminant Level (MCL) is 100 ppb); benzene at concentrations ranging from non-detect to 3 ppb (MCL is 5 ppb); chloroethane at concentrations from non-detected to 3 ppb and single hits of 1,2-dichloroethane at 1 ppb and acetone at 25 ppb. During the same years, manganese concentrations ranged from 3.5 to 5.2 mg/L.

5.4.4 The Sand Aquifer (SA) and the Lower Silt Aquitard

5.4.4.1. Hydrogeology of the Sand Aquifer and the Lower Silt Aquitard

The SA occurs as a widespread regional deposit of interbedded sands and silts 200 to 300 feet

below the surface. Flow in this aquifer in the vicinity of the landfill is generally from the north and west to the southeast toward a hydraulic sink that occurs across a broad area beneath the southern part of the landfill and extending several hundred feet to the east (Figure 5-7). Groundwater to the south and east of this sink also flows towards the sink. Consequently, the sink limits the extent that the landfill impacts the SA, and impacts are not seen beyond the sink to the east. This sink is believed to be located from the southeastern section of the landfill and up to 800 feet further east. Groundwater entering this sink flows downward into the Southern Gravel Aquifer (SGA).

The deepening of the sink in the UGA as the landfill dewatered is also seen in the SA where the SA sink has also deepened over the last 5 years. The two SA groundwater flow monitoring wells within the footprint of the landfill are currently dry, and have been for several years; the down gradient SA groundwater chemistry monitoring wells, which are located further from the landfill, only sometimes contain sufficient water for sampling.

The SA and SGA are separated by the Lower Silt Aquitard. Like the Upper Silt Aquitard, the Lower Silt Aquitard is present as a significant unit throughout the site, but is discontinuous in places. These "windows" in the aquitard allow for the downward flow from the SA into the SGA. The largest such window identified in the study area exists below the sink in the SA.

5.4.4.2. Water Quality in the Sand Aquifer

The post-1990 monitoring network in the SA initially included four up gradient wells (MW-8B, MW-30B, MW-17B, and MW-21B) and three down gradient wells (MW-15A, MW-20A, and MW-23A). MW-30B was originally installed as a down gradient well, but the potentiometric surface showed that it was actually up gradient of the landfill on the far side of the groundwater sink formed by SA groundwater discharging into the SGA. The well has consistently been clean, and has been deleted from the groundwater monitoring network.

In this aquifer, the groundwater quality situation is complex because of up gradient contamination flowing towards the landfill. The up gradient wells MW-17B and MW-21B are contaminated with chlorinated solvents, as shown below:

Up Gradient Monitoring Wells In the Sand Aquifer - Recent Concentrations

	Recent concentrations	MCL
MW-17B		
1,1-dichloroethane	90 to 160 ppb	800 ppb*
1,1-dichloroethene	4.8 to 8.2 ppb	7 ppb
1,2-dichloroethane	8 to 12 ppb	5 ppb
MW-21B		
1,1-dichloroethane	11 to 14 ppb	800 ppb*
1,1-dichloroethene	1.6 to 2.6 ppb	7 ppb
tetrachloroethene	24 to 35 ppb	5 ppb
trichloroethene	2.4 to 3.1 ppb	5 ppb

* 1,1-dichloroethane has no MCL. 800 ppb is the MTCA Method B cleanup level in the 2/96 CLARC II table.

Contamination in MW-17B has remained fairly constant over the last decade, while contamination at MW-21B has been increasing slightly over the last several years. These two wells remain the most contaminated wells in the monitoring well network, in terms of number of contaminants found in the groundwater. Both Ecology and the City of Seattle have conducted studies to identify possible sources of this up gradient contamination.

MW-15A and MW-23A were selected to provide water quality information in the hydraulic sink area. MW-23A has not been sampled since 1993 due to declining groundwater levels in the Sand Aquifer. MW-15A was not sampled between 1993 and 1997, but has had sufficient water for sampling from 1997 to the present. Since 1997 all VOCs have been non-detected except 1,2-dichloroethane with concentrations from 1.1 to 2.1 ppb and manganese concentrations have ranged from 0.005 to 0.028 mg/L. In the two or so years prior to water levels getting low, MW-23A had similarly low concentrations of VOCs with 1,1-dichloroethene from non-detected to 2 ppb; 1,2-dichloroethane from 1.9 to 4 ppb; and trichloroethene from non-detected to 2 ppb. Manganese concentrations ranged from 1.7 to 4.1 mg/L.

One additional sand aquifer monitoring well (MW-20A) is located just west of the landfill. This well is hydraulically down gradient of the up gradient source area near MW-17. Monitoring well MW-20A is also located hydraulically up gradient of the western edge of the landfill because water from the Sand Aquifer flows underneath the landfill and down into the Upper Gravel Aquifer. Historically, the water quality in the zone monitored by MW-20A was impacted by both landfill and up gradient sources. MW-20A has been dry and thus not sampled since 1994. In the two or so years before going dry, the following concentrations were found in MW-20A:

MW-20A - 1992 to 1994 Concentrations

	1992 to 1994 Concentrations	MCLs
1,1,1-trichloroethane	non-detected to 2.4 ppb	200 ppb
1,1-dichloroethane	12 to 37 ppb	800 ppb*
1,2-dichloroethane	2 to 5.3 ppb	5 ppb
1,2-dichloroethene	non-detected to 2 ppb	70 ppb
benzene	non-detected to 1.1 ppb	5 ppb
chloroethane	15 to 20 ppb	***
manganese	0.735 to 1.28 mg/L.	2.2 mg/L**

* 1,1-dichloroethane has no MCL. 800 ppb is the MTCA Method B cleanup level in the 2/96 CLARC II table.
** manganese has no primary MCL. 2.2 mg/L is the MTCA Method B cleanup level in the 2/96 CLARC II table.
*** chloroethane, also known as ethyl chloride, has no MCL nor MTCA Method B cleanup level in the 2/96 CLARC II table.

5.4.5. The Southern and Northern Gravel Aquifers

5.4.5.1. Hydrogeology of the Southern and Northern Gravel Aquifers

The deepest stratigraphic units studied were the Northern and Southern Gravel Aquifers (NGA and SGA, respectively); they occur at about the same elevation (300 to 350 feet below the surface), but hydraulic heads in the NGA are typically 100 feet higher than heads in the SGA. During the RI, the NGA was found to be clean and unimpacted.

The SGA is found beneath the southern half of the landfill and extends to the east, south and west. It consists of permeable sands and gravel interbedded with silts and silty gravel. The SGA appears to be recharged by the SA and by lateral flow from the south. A groundwater mound in the SGA, below the hydraulic sink in the SA, is believed to be an expression of regional flow through the sink. Groundwater flow from the mound is to the east and west; flow to the north is blocked by higher potentiometric heads within the NGA. Groundwater in the SGA eventually discharges west to Puget Sound and east to the Green River Valley. The 1998 potentiometric surface of the SGA is shown in Figure 5-8. Although the groundwater mound is still present, water levels along the historical high point (MW-14B, for example) have dropped by as much as 10 feet from pre-remedial conditions.

Responses to changing recharge conditions have been fairly rapid between the base of the landfill and the SGA, with decreases in the SGA water levels occurring in less than 5 years

from completion of the remedy required by the 1990 consent decree. Once groundwater enters the SGA, the primary direction of flow shifts from vertically downward to horizontal, with much lower potentiometric heads driving the flow indicating that water movement within the SGA horizontally away from the landfill will be much slower than vertical movement into the SGA.

5.4.5.2. Water Quality in the Southern Gravel Aquifer

Currently, the Southern Gravel Aquifer is the primary aquifer in which groundwater moves out and away from the landfill, and thus is the primary potential groundwater exposure pathway beyond the landfill property.

The post-1990 monitoring network in the SGA initially consisted of one up gradient well (MW-24B) and five downgradient wells (MW-14B, MW-20B, MW-23B, MW-29B, and MW-30C). Well 24B has since been removed from the water quality monitoring network because it has never shown any evidence of groundwater contamination.

Monitoring wells MW-14B, MW-23B, and MW- 29B form a line of monitoring wells to the east of the landfill, with MW-14B located at the edge of the landfill, and the other two wells approximately 600 and 1,500 feet further east, respectively.

The monitoring results for MW-14-B are interesting. (Table 5-1.) While the average 1,2-dichloroethane concentration during the RI was 50 ug/L, and were generally in the 10 to 20 ug/L range in the early 1990's, the 1,2-dichloroethane concentration has been non-detectable (with a detection limit of 1 ug/L) in this well in the four sampling rounds between May 1998 and November 1999. Similarly, while the average vinyl chloride concentration during the RI was 4 ug/L, and the concentrations were generally in the 2 to 4 ug/L range in the early 1990's, vinyl chloride concentration has been non-detected (with a detection limit of 1 or 2 ug/L) in this well in these four recent sampling rounds. Cis-1,2-dichloroethene is also found in the 5 to 7.7 ug/L range (the MCL is 70 ug/L) as has been 1,1-dichloroethane in the 1.6 to 3 ug/L range (no MCL, but the MTCA Method B cleanup level is 800 ug/L.) No other monitored VOCs have been detected in the past two years. Concentrations of chloride (a leachate marker) and manganese (from 4.8 mg/L average in the RI to approximately 1.5 mg/L in 1999) have shown similar reductions. Since MW-14B is located where SA groundwater discharges into the SGA, and the SA has been in compliance since 1994, this change is interpreted as the beginning of a "clean front" moving into the SGA.

Concentrations in MW-23B (Table 5-2) have also been declining, but at a slower rate. For example, average RI concentrations of 1,2, dichloroethane and vinyl chloride were 13 ug/L and 5 ug/L respectively; concentrations of these chemicals have been around 7 ug/L and 2 ug/L, respectively, in the four sampling rounds since May 1998. Manganese concentrations have always been low in this well, generally around 0.3 mg/L. Cis-1,2-dichloroethane is also

detected in this well in the 4.5 to 6.4 ug/L range.

Concentrations are remaining constant in MW-29B. For example, over the past three years, 1,2-dichloroethane has consistently been detected in the 5 to 10 ppb range (as compared to the RI average concentration of 5 ppb) with 1,1-dichloroethane detected a single time at 1.2 ppb and vinyl chloride detected a single time at 1.1 ppb. Manganese concentrations are low and have ranged from 1.06 to 1.24 mg/L over the past four years.

The volatile COCs historically have rarely been detected in downgradient wells MW-20B (to the west of the landfill) or MW-30C (to the far southeast of the landfill).

Background manganese concentrations are high in the SGA and the related Northern Gravel Aquifer, with the regional background concentration considered to be 1.1 mg/L. MW-24B, MW-23B, MW-29B, and MW-30C all have manganese concentrations at or below background; and manganese concentrations in MW-14B have been decreasing rapidly over the last few years as a "clean front" of less contaminated groundwater enters the SGA. However, manganese concentrations in MW-20B are above background and increasing, with concentrations in the 4.5 to 5.87 mg/L range over the past 3 years, as compared to an average of 1.84 mg/L during the RI. Since this well also has elevated levels of chloride, which is a marker of landfill leachate, the cause is likely an indirect result of Midway Landfill leachate. Manganese is a natural mineral that likely is dissolving into the groundwater because of the chemistry of the landfill leachate.

In summary, two volatile COCs are detected above MCLs to the east of the landfill in MW-23B and MW-29B, but have not been detected in recent rounds in MW-14B near the landfill boundary. Manganese concentrations exceed background in MW-14B and MW-20B, but are decreasing rapidly toward background in MW-14B.

5.5. Nature and Extent of Gas Migration

The Upper Gravel Aquifer beneath the landfill is under vacuum from the landfill gas collection system. The vacuum extends to the Sand Aquifer is some locations. Sixty-three gas probes throughout the neighborhood are regularly monitored for landfill gas. Figure 5-9 shows the extent of the vacuum system beneath the landfill. As of 1997, none of the off-landfill property gas extraction wells were still in use because of the significant decreases in off-property methane gas concentrations. All gas probes and gas monitoring locations surrounding the landfill are under the state's landfill gas regulatory limits and all such monitoring locations where the limit may be approached are under the influence of the gas collection system. During the RI, numerous hazardous substances were found in the extracted landfill gas including vinyl chloride, xylenes, toluene, benzene and other solvents.

City of Seattle
Greg Nickels, Mayor

Seattle Public Utilities
Chuck Clarke, Director

July 13, 2005

Subject: Midway Landfill Covenant File
City of Seattle, SPU internal R/W # 8415 Drainage and Wastewater Files

NOTE to whom it may concern,

Map exhibits have been removed from this document at this point for recordation due to the requirements of King County. Some maps were 11" X 17" in size and some maps would not meet the clarity requirements when scanned. The Real Estate Services Office of the Seattle Public Utilities, The City of Seattle have copies of these exhibits on file (R/W file #8415) or you may contact the Department of Ecology and ask them for the Midway covenant map files exhibits under the King County recording number of this document.

If you have any further questions, please feel free to contact the Real Estate Office of Seattle Public Utilities, The City of Seattle.

Sincerely,

Effie K. Moody
Real Property Services
Seattle Public Utilities
The City of Seattle

Seattle Municipal Tower, 700 Fifth Avenue, Suite 4900, PO Box 34018 Seattle, WA 98104
Tel: (206) 684-5851, TTY/TDD: (206) 233-7241, Fax: (206) 684-4631. Internet Address: http://www.seattle.gov/util/

5.6 Surface Water, Seeps and Soil Contamination

Surface water, seeps and soils in areas around the landfill were sampled in the late 1980's as part of the RI and no contamination from the Midway Landfill was found.

6. Current and Potential Future Land and Resource Uses

Land Use: Currently, the landfill is capped and fenced. No public access is allowed. Future land use has been the subject of an extensive but preliminary 1992 study by community representatives, the City of Kent, and the City of Seattle. Some possible uses considered desirable by the Midway Citizens Advisory Committee include open space uses such as a passive park, a sports complex with ball fields, or garden center. Less desirable but potentially possible future uses would be a golf driving range or a park and ride facility. All uses would be designed to protect the integrity of the cap and other containment systems.

Groundwater uses: To the best of Ecology's and the City's knowledge, no one is drinking the groundwater from any aquifer within almost a mile of the landfill, and there are no current plans to use the groundwater near the landfill for drinking water. The closest wells currently in use for drinking water are the Lake Fenwick wells almost 1 mile southeast of the Midway Landfill.

As part of the Midway Landfill Environmental Impact Survey (EIS) in 1985, the City's contractor located private wells within a one-mile radius of the landfill, and public wells within five miles of the landfill by reviewing numerous agency files. Based on this inventory, the contractor sent questionnaires to approximately 90 households near the landfill in order to verify the existence and use of private wells. The list of households was updated during the RI, and several key downgradient wells were re-verified in 1999. Citizens were also questioned at several public meetings and at meetings of the Midway Action Group regarding their knowledge of any wells in neighborhoods surrounding the landfill.

From this information, 31 private wells were identified within a one-mile radius of the landfill. (See Figure 6-1.) Of the 31 wells, nine are in use, 12 are unused, and 10 are inoperable. Of the nine wells, five are used for drinking water, including the Lake Fenwick supply, which services nine homes, and the other four wells are used for irrigation. The five drinking-water wells are all located over 4,600 feet from the landfill, in the Lake Fenwick area. Three of the four irrigation wells are located over 2,000 feet southwest of the landfill (out of the plume path). The fourth irrigation well is located between the groundwater plume and the Lake Fenwick wells.

Monitoring Well MW-30 in the Southern Gravel Aquifer was added in 1988 to act as an early warning location should any measurable contamination from the landfill move toward the irrigation well or toward the Lake Fenwick wells. MW-30 is still monitored, and has

generally remained clean and unimpacted throughout the groundwater monitoring program.

Two other wells were identified within 1,000 feet of the landfill (Well Nos. 37 and 57). Well No. 57 is dry and owned by the City of Kent. Well No. 37, on privately owned property, is unused and covered.

There are three public wells in the Midway Landfill area. Two are operated by the Highline Water District near the two intersections of South 209th Street and 31st Avenue South, and South 208th Street and 12th Avenue South, respectively. These two wells are screened in the second confined aquifer, at over 120 feet below sea level. Both are over two miles north and northwest from the landfill in an area that is up gradient of the landfill, and are completed in aquifers that are not connected to the affected aquifers. The third well is operated by the Kent Water District at South 212th Street and Valley Freeway and is used to satisfy peak summer demands. None of these municipal wells draw water from affected aquifers, and all are more distant from the landfill than are the Lake Fenwick wells.

Finally, neither water district has future plans to develop groundwater supplies from any aquifers within a one-mile radius of the Midway Landfill. The wellhead protection areas delineated by these utilities do not include the Midway Landfill site.

State regulations (WAC 173-160 -171) do not allow any new private drinking water wells within 1000 feet of a solid waste landfill or 100 feet of all other sources or potential sources of contamination, and notice is required to be given to Ecology prior to the construction of any well. However, the NCP is more stringent and requires EPA to consider all groundwater as drinking water except directly under a waste management area. The landfill area with refuse is a waste management area and thus is not considered a future drinking water source by EPA. All other areas downgradient of the landfill are considered to be potential future drinking water sources. However, it is likely that all future developments lie within water district service areas and, therefore, are not likely to rely on private wells for their potable water supply.

7. Summary of Site Risks

7.1 Human Health Risks - Prior to the Work Required by the 1990 Consent Decree.

Before the cleanup work began at the Midway Landfill site in 1985, there were many ways in which humans could have potentially been exposed to unacceptable levels of contaminants. These exposures could have posed acute hazards to residents due to the high levels of methane gas reaching residential basements, and long-term potential risks from solvents in the groundwater if anyone had been drinking the groundwater. The risks from these possible exposures were greater than EPA's and the State of Washington's acceptable risk levels. For example, if a person had been using the groundwater in MW-14B, one of the most

contaminated down gradient wells, as their source of domestic water for 30 years, the estimated excess cancer risk from vinyl chloride and 1,2-dichloroethane alone would have been approximately 6 x 10-4. Other possible exposures could have occurred through air emissions or through direct contact with the landfill contents.

The City's contractors prepared an Endangerment Assessment (EA) as part of the 1990 RI/FS for Midway Landfill. Because the RI found little contamination in the surface water, seeps or soil, the EA concluded that the contaminants detected in these environmental media had not migrated from the landfill. The EA also found that there was no direct exposure pathway connecting leachate to either human or ecological receptors. The only potential exposure pathways existed through cross-media pathways: volatilization of contaminants from leachate into landfill gas or discharge of leachate into the groundwater system. The contaminants in landfill gas were found to pose a negligible risk leaving leachate to groundwater as the only migration pathway of concern.

7.2 Current and Future Human Health Risks

A baseline risk assessment that follows current EPA Superfund guidance on risk assessment and that reflects current conditions at the landfill has not been performed on Midway Landfill because the contaminants of concern, migration routes, and the risks to human health and the environment were characterized in the 1990 EA. Based on the success of the containment actions required by the 1990 consent decree, there are likely to be no current unacceptable risks to human health from the landfill because the gas migration has been stopped and no one is currently drinking the groundwater. VOC contamination in the groundwater downgradient of the landfill also appears to be decreasing, at least in the well closest to the landfill. The only remaining contaminants of concern appear to be vinyl chloride, 1,2-dichloroethane, and manganese.

Even though no baseline risk assessment has been done, the potential future risk was estimated. Vinyl chloride is a known human carcinogen and 1,2-dichloroethane is a probable human carcinogen. Manganese is an essential nutrient but is toxic in high quantities. The estimated risk was calculated considering only the maximum 1999 concentrations in Well MW-23B, currently the monitoring well with the highest concentrations of VOCs downgradient of the landfill. This estimate was calculated assuming domestic use of the groundwater for drinking and showering, EPA's reasonable maximum exposure assumptions for 30 years, IRIS or Region 9 PRG table toxicity values, and a conservative assumption that the contaminant concentrations will not change in the future. The excess cancer risk is estimated to be approximately 1 x 10-4 (with vinyl chloride being the primary risk driver) and the HI is estimated to be approximately .3 (with manganese being the primary risk driver), both of which are within EPA's acceptable risk range. This cancer risk level is, however, not within the acceptable risk level under Washington's Model Toxics Control Act, which requires that cumulative excess cancer risk be no greater than 1 x 10-5.

The estimated risk was also calculated for MW-20B, again considering only the maximum 1999 concentrations and using the same assumptions. Well MW-20B is currently the monitoring well with the highest concentration of manganese downgradient of the landfill. The Hazard Quotient for manganese in this well is approximately 6.

These estimated risks are potential future risks only, because there are no drinking water wells within the down gradient plume of the landfill, nor are there any plans to place any drinking wells in this area in the future. (See Section 6.)

7.3 Ecological Risks

No ecological risks to plants or animals are expected now or in the future because there will be no exposure to the contaminants at or from the site. The site is covered and capped with clean material, and the groundwater from the site does not impact any surface water bodies or seeps. Surface water discharging from the site is monitored for conventional pollutants such as pH, dissolved oxygen and turbidity. No hazardous substances are expected to be in the surface water discharge from the landfill because the remedial actions under the 1990 consent decree have eliminated surface water contact with the refuse..

7.4. Basis for Action

While the estimated future risk from drinking groundwater downgradient from Midway Landfill is within the NCP acceptable risk range, there is groundwater contamination above federal drinking water standards, or MCLs, in two monitoring wells east of the landfill and I-5. According to EPA policy, when MCLs are exceeded, action is generally warranted. In addition, state groundwater cleanup levels under MTCA are exceeded. Because drinking this groundwater could result in an imminent and substantial endangerment to human health, remedial action is needed at Midway Landfill.

8. Remedial Action Objectives

Midway Landfill is an example of a site where containment has been successful and has reduced the risks posed by the site. However, the containment measures already in place must be maintained and institutional controls are necessary to ensure continued long-term protection of human health and the environment.

The remedial action objectives of this response action are:

- To ensure containment is effective and working
- To ensure containment will be maintained
- To return groundwater to drinking water standards and state cleanup standards

downgradient of the landfill boundary
- To ensure no residential exposure to groundwater until groundwater cleanup standards have been met

Cleanup Standards

For groundwater that is a potential future source of drinking water, the more stringent of federal drinking water standards (also known as Maximum Contaminant Levels or MCLs) and State of Washington cleanup standards under the Model Toxics Control Act (MTCA) are the cleanup levels. For the groundwater contaminants at this site, the cleanup levels and their basis are shown in Table 1.

Table 8-1. Groundwater Cleanup Standards

Contaminant	Cleanup Level	Basis of the Cleanup Level
1,2-dichloroethane	5 ug/L	Federal Drinking Water Standard (MCL)
vinyl chloride	.02 ug/L*	MTCA Method B.
manganese	2.2 mg/L	MTCA Method B

* Pursuant to WAC 173-340-707(2), Ecology will utilize the practical quantitation limit (PQL) of 0.2 ug/L to determine compliance with this cleanup standard because the cleanup standard is lower than the PQL.

1,2-Dichloroethane and vinyl chloride are solvents. Vinyl chloride can also be formed in groundwater during the natural breakdown of other solvents. Manganese is a natural mineral in soil that dissolves into the groundwater because of the chemistry of the water leaving the landfill.

If other contaminants resulting from releases from the landfill are found in any downgradient monitoring well, cleanup levels, if necessary, will be established for these additional contaminants using the federal drinking water standards and MTCA.

The point of compliance for the groundwater will be at the edge of the landfill waste as specified in a Compliance Monitoring Plan to be approved by Ecology. Under MTCA, this location is considered a "conditional point of compliance." All groundwater downgradient of

this point of compliance will need to meet these cleanup levels for contaminants resulting from releases from the landfill before the Midway Landfill is removed from the Superfund National Priorities List.

9. Summary of Remedial Alternatives

Two remedial alternatives were considered for the Midway Landfill site.

No Action Alternative:

Under the No Action alternative, EPA would not require any additional action at the Midway Landfill site. The City of Seattle would still have to fulfill its responsibilities under its 1990 consent decree with Ecology, as well as any other requirements established under state or local regulations for closed landfills. Monitoring could be required under this alternative. EPA would not set cleanup levels nor points of compliance under this alternative.

Limited Action Alternative:

This alternative does not require any significant additional remedial construction because the actions taken by the City of Seattle since 1985 have eliminated or greatly reduced the contaminants leaving the landfill. Instead, this alternative focuses on maintaining and monitoring the constructed containment remedy to ensure it is and will continue to be effective and protective. This alternative would also set groundwater cleanup levels and points of compliance. This approach is consistent with EPA's presumptive remedy for municipal landfills.

The main elements of the limited action alternative are:

1. Monitoring to :
   a) ensure the remedial systems are working as designed,
   b) ensure progress is being made towards meeting the groundwater cleanup standards,
   c) ensure adequate containment is maintained when and if major changes are approved by Ecology in the operation of the site, such as turning off or scaling down the gas collection system, and
   d) demonstrate that the cleanup levels have been achieved.

2. Continuing to operate and maintain all remedial elements required in the 1990 Ecology/City of Seattle consent decree.

3. Implementing institutional controls. Institutional controls are legal or administrative actions that help ensure the long-term protectiveness of the remedy. At this site, the limited action alternative includes three types of institutional controls. The first type of institutional control would be a legal notice the City would place in King County's records, alerting any

future purchaser of the property, in perpetuity, that this property had been used as a landfill and was on EPA's National Priorities List, and that future use of the property is restricted. The second type of institutional control is a requirement that the City ensures continued operation and maintenance of the containment and monitoring systems if ownership of the property should change. Both of these institutional controls are required as part of the 1990 consent decree between Ecology and the City of Seattle, though the legal notice has not yet been placed in the County's records. The third type of institutional control is an annual written notice about the groundwater quality down gradient from the landfill. The City of Seattle would be required to notify the Seattle-King County Department of Public Health, nearby water districts, locally active licensed well drillers and Ecology. As an additional protection, state regulations forbid any private drinking water wells within 1,000 feet of a municipal landfill or within 100 feet from all other sources of potential contamination.

The remedy would also be reviewed no less often than every five years to ensure that the remedial action remains protective of human health and the environment.

10. Comparative Evaluation of Alternatives

EPA evaluated the two alternatives using the nine criteria established in EPA's National Oil and Hazardous Substances Pollution Contingency Plan. The nine criteria are divided into three categories: threshold, balancing, and modifying criteria. To be eligible for selection, an alternative must meet the first two threshold criteria. The next five criteria are the balancing criteria which weigh trade-offs among the alternatives. The last two modifying criteria are considered after the public comment period during the final selection of the remedy.

Overall Protection of Human Health and the Environment

Both alternatives are protective, because the City of Seattle would continue to operate and maintain the cap, and the gas and storm water systems under both alternatives.

Compliance with Applicable or Relevant and Appropriate Requirements

Federal and state drinking water standards and MTCA groundwater cleanup standards are the primary applicable or relevant and appropriate requirements under the Limited Action Alternative. The cleanup standards listed above would need to be met in the downgradient monitoring wells before the remedial action at the Midway Landfill could be considered complete. No cleanup standards would be set by EPA under the No Action Alternative, though Ecology could decide to set cleanup standards separately under MTCA at a later time.

Long-term Effectiveness and Permanence

The Limited Action Alternative has greater long-term effectiveness and permanence than the No Action Alternative because it would require annual notice to water districts and well permit regulators, which would provide slightly greater assurance that no one would drink the groundwater leaving the landfill. It would also clarify the need to adjust monitoring requirements as site conditions change.

Reduction of Toxicity, Mobility and Volume of Contaminants through Treatment
Neither alternative includes any additional treatment. Extracted landfill gas is flared as part of the existing landfill gas collection system.

Short-term Effectiveness
Both alternatives have the same short-term effectiveness. Neither alternative includes construction nor will either alternative affect the time needed for all groundwater leaving the site to meet cleanup standards.

Implementability
Both alternatives are equally implementable.

Cost
The costs for the two alternatives are expected to be very similar. The monitoring costs for the Limited Action Alternative may be slightly higher than the monitoring costs for the No Action Alternative.

State Acceptance
Ecology was consulted on the proposed plan and reviewed this ROD. Ecology concurs with the selected limited action remedy.

Community Acceptance

Four comment letters have been received. Two letters, from the Seattle-King County Department of Public Health and from a local resident, supported the Limited Action Alternative. The second letter, from the City of Des Moines, does not express any opinion about the alternatives, but is concerned about turbidity that may be leaving the landfill cap and discharging into North McSorley Creek. The City of Des Moines asked the City of Kent and the City of Seattle to prepare a storm water pollution plan for turbidity from this outfall, and asked for specific monitoring. The City of Seattle supported the Limited Action Alternative, but requested certain changes and clarifications. A longer summary of these comments and EPA's responses can be found in the attached Responsiveness Summary.

EPA staff also received informal comments through phone calls. In these calls, five members of the public supported the limited action alternative.

11. The Selected Remedy

11.1 Summary of the Rationale for the Selected Remedy

EPA's selected remedy is the Limited Action Alternative. Of the alternatives considered, this alternative will provide the best long-term protectiveness at the Midway Landfill site. It sets groundwater cleanup standards and it ensures long-term operation, maintenance, and monitoring of the containment systems at the Midway Landfill site. It would also clarify the need for, and types of, institutional controls that are necessary to ensure long-term protectiveness of the remedy.

Additionally, this alternative will best ensure long-term protectiveness of the containment remedy currently in place. While EPA believes no new remedial construction (as EPA guidance defines the term) is needed, it is important that the City of Seattle continue to operate and maintain the gas collection system, the cap that was constructed over the landfill, and the storm water collection system. The City also needs to continue to monitor the effectiveness of these actions, and to regularly sample the groundwater until groundwater cleanup standards have been met. The City needs to establish permanent, legally binding, controls on the landfill property to ensure that the cap and containment systems are not damaged as long as the cap and gas and storm water systems are required. The less formal institutional control requirements, in the form of notices to agencies, water districts, and active well drillers, for the off-property groundwater contamination are appropriate for this site considering that the area is fully served by community water systems, no private wells are known to be in use, and the relatively low levels of remaining contamination in the downgradient monitoring wells. Also, groundwater cleanup levels for the groundwater downgradient of the landfill need to be established.

In order for Ecology to utilize this ROD as a Cleanup Action Plan, the cleanup action established through the ROD must meet the MTCA remedy selection requirements of WAC 173-340-360(2) (threshold requirements) and (3) (requirement to utilize permanent solutions to the maximum extent practicable; requirement to provide for a reasonable restoration time frame; requirement to consider concerns raised during public comment.) WAC 173-340-360(13). The threshold requirements for remedy selection are that the remedy shall protect human health and the environment, comply with cleanup standards, comply with applicable state and federal laws, and provide for compliance monitoring. Ecology has determined that the selected remedy, as described in the ROD, satisfies those threshold requirements.

With respect to MTCA's preference for permanent solutions, Ecology has determined that the following remedies for individual components, taken together, are permanent to the maximum extent practicable in that they prevent or minimize the migration of hazardous substances into the environment and provide for a net reduction in the amount of hazardous substances

released from the source area. First, with respect to the Midway Landfill refuse itself, Ecology has determined that the isolation and containment remedy of the 1990 consent decree and this ROD is the preferred available cleanup technology. See WAC 173-340-360(9)(c) (describing Ecology's expectations of sites with large volumes of materials with relatively low levels of hazardous substances where treatment is impracticable.) With respect to landfill gas generated by the refuse, Ecology has determined that the treatment of such gas, as specified under the 1990 consent decree and this ROD, constitutes "destruction or detoxification" which is the highest preference cleanup technology under MTCA. With respect to groundwater contaminated by landfill leachate, Ecology has determined that the incremental benefit to be realized from implementing additional remedial engineering measures (e.g. treatment) is substantially and disproportionately outweighed by the cost of such measures. This determination is based upon the facts that: 1) the actions taken by the City of Seattle since 1985 have eliminated or greatly reduced the contaminants leaving the landfill; 2) the levels of contamination that remain in the groundwater are low and trending towards compliance with cleanup standards; and 3) the groundwater does not have any current human or environmental receptors. Therefore, Ecology has determined that institutional controls and monitoring, as required under this ROD, constitute an appropriate remedy for groundwater until cleanup levels are achieved.

With respect to a reasonable restoration time frame, EPA and Ecology agree that the remedial actions implemented have created conditions under which groundwater will achieve compliance with the cleanup standards over time. Based on the results of the groundwater monitoring to date, it is apparent that groundwater down gradient of the landfill is very near compliance with the cleanup standards. Ecology concludes that based on present trends, it is likely that groundwater down gradient of the landfill will reach compliance with cleanup standards in approximately five years. Based upon the facts that institutional controls aimed at preventing the use of contaminated groundwater as a drinking water source are a component of this ROD, that the contaminant levels are already low; and that a documented trend towards compliance exists. Ecology has concluded that this constitutes a reasonable restoration time frame.

Finally, Ecology has determined that the ROD has considered concerns raised during public comment. (See ROD Section 13 and EPA Responsiveness Summary.)

11.2. Detailed Description of the Selected Remedy

The selected remedy consists of:

1. Monitoring to :
   a) ensure the remedial systems are working as designed,
   b) ensure progress is being made towards meeting the groundwater cleanup standards,
   c) ensure adequate containment is maintained when and if major changes are approved by Ecology in the operation of the site, such as turning off or scaling down the gas collection

system, and

d) demonstrate that the cleanup levels have been achieved.

The monitoring will be done by the City of Seattle, while Ecology will continue to be the lead cleanup regulatory agency at the site. The details of the monitoring requirements have been set out by the City of Seattle in an Ecology-approved compliance monitoring plan.

Monitoring, including installation of new monitoring wells, are among the activities EPA expects at sites even after EPA determines that construction has been "completed" at a site. Through the procedures outlined in the agreements between Ecology and the City of Seattle, Ecology may require the City of Seattle to install and monitor new monitoring wells if needed.

If necessary, the monitoring program may also address the issue of the source of turbidity in North McSorley Creek raised by the City of Des Moines in their comment letter on the proposed plan. The City of Des Moines requested that the City of Seattle continue to monitor the S. 250th Street outfall for turbidity during storm events (on a periodic basis) and provide the results to the City of Des Moines Engineering Department.

2. Continuing to operate and maintain all remedial elements required in the 1990 consent decree. Ecology will continue to oversee the City's operation and maintenance activities. Operational changes can be approved by Ecology when such changes ensure that the site and remedy will remain protective. The Seattle King County Public Health Department should be given the opportunity to review requested operational changes.

3. Implementing institutional controls. Institutional controls are legal or administrative actions that help ensure the long-term protectiveness of the remedy. At this site, the selected remedy consists of three types of institutional controls. Variations of the first two types of institutional controls are already required in the 1990 consent decree.

First, the City of Seattle will place a notice in the records of real property kept by the King County auditor, alerting any future purchaser of the landfill property, in perpetuity, that this property had been used as a landfill and was on EPA's National Priorities List, and that future use of the property is restricted. The use restriction shall comply with the post-closure use restrictions under the State of Washington's Criteria for Municipal Solid Waste Landfills (WAC 173-351-500(1)(I) and (2)(c)(iii). The City has not yet placed any legal notice in the County's records even though a form of this notice was required by the 1990 consent decree. EPA understands that this is a subject that will be addressed through an amendment to the 1990 consent decree. EPA expects the City to place this notice on the deed within six months of the date of effective date of the consent decree amendment, unless the City has negotiated an alternative enforceable schedule with Ecology.

Second, the City needs to ensure continued operation and maintenance of the

containment and monitoring systems if any portion of the property is sold, leased, transferred or otherwise conveyed.. This requirement is an element of the 1990 consent decree.

Third, notices are needed so that no water supply wells are constructed and used in areas with groundwater contamination emanating from the landfill. These notices shall include at a minimum the following:

- The City will annually notify the Seattle-King County Department of Public Health, Ecology, the local water districts (currently, the Kent and Highline Water Districts) and locally active well drillers in writing of groundwater conditions in the affected areas downgradient of the landfill. This notice will include a map showing the location of the affected areas and indicate which aquifers are affected and their elevations. This information shall be updated annually and can be part of an annual groundwater monitoring report. Locally active well drillers are all well drillers that have drilled wells within King County in the year prior to the notice. Ecology will provide the list of locally active well drillers to the City. This requirement for annual notices can be removed or modified by Ecology after groundwater cleanup standards have been met in the groundwater monitoring wells downgradient from the landfill.
- The City of Seattle will also annually notify owner of Well #37 (See figure 6-1) in writing of groundwater conditions in the area of the well. Alternatively, the City of Seattle can provide to Ecology adequate assurances that this well has been properly abandoned.

As an additional protection, state regulations forbid any private drinking water wells within 1,000 feet of a municipal landfill or 100 feet from all other sources or potential sources of contamination (WAC 173-160-171). State regulations (WAC 173-160-151) also requires a property owner, agent of that owner, or a water well operator to notify Ecology of their intent to begin well construction prior to beginning work. This notification can provide notice to Ecology if anyone plans to build a new water well too near Midway Landfill.

Ecology will continue to be the lead regulatory agency overseeing the performance of the selected remedial action by the City of Seattle. However, if necessary, EPA could use its statutory authority to ensure that actions selected by this ROD are implemented.

The groundwater cleanup standards for the current contaminants of concern can be found in Table 8-1. If other contaminants resulting from releases from the landfill are found in any down gradient monitoring well, cleanup levels, if necessary, will be established for these additional contaminants using the federal drinking water standards and MTCA.

The point of compliance for the groundwater will be at the edge of the landfill waste as specified in a Compliance Monitoring Plan to be approved by Ecology. Under MTCA, this location is considered a "conditional point of compliance." All groundwater downgradient of this point of compliance will need to meet these cleanup levels for contaminants resulting

from releases from the landfill before the Midway Landfill is removed from the Superfund National Priorities List.

One of the City of Seattle's concerns is that contaminated groundwater is coming into the landfill from up gradient sources, and that this in-coming contaminated groundwater will never allow the groundwater leaving the landfill to meet the groundwater cleanup standards. Because of the major improvements in downgradient water quality in the last ten years, EPA believes it is possible that the groundwater leaving the landfill will eventually meet the groundwater cleanup standards. However, if in the future the City wants to demonstrate that it is technically impracticable for them to meet the cleanup standards at every downgradient well because of the up gradient sources, EPA and Ecology will work together with the City to determine what information is needed to support such a demonstration.

Because the selected remedy will result in hazardous substances remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted under CERCLA within five years of this Record of Decision to ensure that the remedy continues to be protective of human health and the environment. Because Ecology is expected to continue to be the lead regulatory agency for this cleanup, EPA would expect Ecology to perform the five year review at this site.

The City of Seattle estimates that the closure costs of Midway Landfill amounted to about $56.5 million as of 1995. This does not include the ancillary costs associated with the landfill such as the "Good Neighbor Policy" (See Section 3.) In recent years, the budgeted and actual operation and maintenance costs have ranged from $432,000 to $535,600 annually. This amount includes monitoring costs.

11.3 Expected Outcomes of the Selected Remedy

This section presents the expected outcomes of the selected remedy in terms of resulting land and groundwater uses.

All future land use at the landfill must be designed and implemented in a manner that will maintain the integrity of the remedy required under the 1990 consent decree. A number of future land uses have been suggested by Midway Citizens Advisory Committee, working with the Cities of Kent and Seattle in 1992. While this selected remedy clarifies the legal notices that need to be in place to ensure the long-term effectiveness of the containment systems, the selected remedy does not place any additional limits on future land use at the Midway Landfill site and does not change the feasibility of the possible future uses suggested by the Advisory Committee.

Groundwater use directly under the landfill will always be restricted. Once the groundwater downgradient from the landfill meets the cleanup standards established in this ROD, nothing

in this selected remedy would forbid use of this groundwater for drinking water. The cleanup levels selected in this ROD are either equal to or more stringent than the federal MCLs. However, state and local regulations place other limits on the use of the groundwater. For example, state regulations forbid any new private drinking water wells within 1000 feet of a municipal landfill.

12. Statutory Determinations

12.1 Protection of Human Health and the Environment

The selected remedy will protect human health and the environment by a combination of engineering and institutional controls. The engineering controls that have been constructed at Midway Landfill by the City of Seattle have been effective in containing gas migration and leachate release from the landfill. This effectiveness is demonstrated by the City's gas monitoring results and by the decreasing water levels in and below the landfill and the decreasing concentration of hazardous substances in the groundwater downgradient from the landfill. The selected remedy will ensure long-term protectiveness by requiring that the containment systems remain effective, that monitoring will continue and be adjusted as necessary, and by clarifying and improving the institutional controls associated with the site and the remedy to ensure that no one will be exposed to the contents of the landfill nor to contaminated groundwater. Implementation of the selected remedy will not pose unacceptable short-term risks or cross-media impacts.

12.2 Compliance with Applicable, or Relevant and Appropriate Requirements

The selected remedy for Midway Landfill will comply with all federal and state ARARs. The chemical-, action-, and location-specific ARARs are as follows:

The Washington Model Toxics Control Act (MTCA) Cleanup Regulations (Chapter 173-340 WAC) are applicable. In particular, MTCA is applicable to the determination of the order of preference of cleanup technologies (WAC 173-340-360(4)), to require the provision of a reasonable restoration time frame (WAC 173-340-360(6)), the establishment of groundwater cleanup levels (WAC 173-340-720(3)), selection of the point of compliance (WAC 173-340-720(6)), the determination of attainment of the groundwater cleanup level when the practical quantitation limit is greater than the cleanup level (WAC 173-340-707), and the format of the institutional controls (WAC 173-340-440.)

Certain landfill closure and post-closure requirements in the Washington Criteria for Municipal Solid Waste Landfills (Chapter 173-351 WAC) and in the Washington Minimum Functional Standards for Solid Waste Handling (Chapter 173-304 WAC) are relevant and appropriate. Specifically, the notation on the deed requirement in WAC 173-351-500 (1)(I) and the minimum functional standard for explosive landfill gas in WAC 173-304-460(2)(b) are relevant and appropriate.

The primary federal drinking water standards (40 CFR 141), known as the MCLs, established under the Safe Drinking Water Act, are relevant and appropriate to the establishment of the groundwater cleanup standards downgradient of the landfill.

12.3 Cost-Effectiveness

The costs of the selected remedy are proportional to its overall effectiveness. The costs of this remedy are similar to the costs of the no action alternative, but provide better long term protectiveness.

12.4 Utilize Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The selected remedy utilizes permanent solutions to the maximum extent practical. EPA's presumptive remedy for municipal landfills is containment. Ten years of monitoring data show that the containment remedy has been successful in reducing the risks and exposures from the site. The selected remedy helps ensure that the containment remedy will continue to be protective.

12.5. Preference for Treatment as a Principal Element

The selected remedy at Midway Landfill satisfies the statutory preference for treatment as a principal element of the remedy. Extracted landfill gas is flared as part of the existing landfill gas collection system. During the RI, numerous hazardous substances were found in the extracted landfill gas including vinyl chloride, xylenes, toluene, benzene and other solvents.

12.6 Five year reviews

Because this remedy will result in hazardous substances remaining above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years of this Record of Decision to ensure that the remedy continues to be protective of human health and the environment.

13. Documentation of Significant Changes from the Preferred Alternative in the Proposed Plan

There are no significant changes between the preferred alternative described in the proposed plan and the remedy selected in this ROD

The following minor changes have been made from the preferred alternative in the proposed plan:

- An additional RAO has been added to clarify that returning groundwater downgradient of the landfill to drinking water and state cleanup standards is a goal of this remedial action.
- The ROD clarifies that details of the landfill monitoring program have been established by Ecology and the City of Seattle in a compliance monitoring plan. The proposed plan implied that Ecology would establish the details unilaterally.
- The selected remedy includes a minor changes to the institutional control requirements for notification of well drillers. The notice will be provided to well drillers that have been recently active in King County. Ecology will provide the list of locally active well drillers to the City of Seattle.
- The ROD does not contain the statement that Ecology determines when the site meets cleanup levels. The City can contact both Ecology and EPA when the City believes the site has met all of the requirements of this ROD and thus could be considered for deletion from the NPL.
- The remedy selected in this ROD has an added requirement that the City annually notify the owner of one off-property well, unless the City provides Ecology adequate assurances that this well has been properly abandoned.

These changes are a logical outgrowth of the information presented in the proposed plan and in the administrative record.

Table 5-1

Southern Gravel Aquifer, Downgradient Well
Monitoring Well 14B

Report Number	Sampling Date	Chloride (mg/L)	Manganese (mg/L)	1,2 Di-chloroethane (ug/L)	Vinyl Chloride (ug/L)
RI Average		219	4.8	50	4
1	February 1990	280 J	3.9	27	1 U
2	May 1990	175	3.6	1 U	1 U
3	August 1991	180	5	25	1 U
4	January 1991	180	4	31	3
5	April 1991	190	3.6	20	2
6	July 1991	170	4	20	4
7	October 1991	212	2.8	29	3
8	March 1992	22	3.5	19	1 U
9	June 1992	146	3.9	19	4
10	September 1992	201	3.7	16	1 U
11	December 1992	153	3.86	13	2.6
12	April 1993	162	3.49	2.3	1 U
13	June 1993	159	3.38	12	3.1
14	September 1993	168	3.45	10	3.3
15	December 1993	127	3.49	8.8	3.4
16	March 1994	165	344		
17	May 1994	154	3.19	6	1
18	September 1994	140	3.88		
19	December 1994	160	3.06	6 J	1 U
20	March 1995	190	3.3		

21	May 1995	140	3.26	20	2.2
22	September 1995	180	3.22		
23	December 1995	170	3.14	9.2	2.7
24	March 1996	150	3.19		
25	May 1996	180	3.07	6.6	2.5
26	September 1996	170	2.96		
27	December 1996	130	2.8	2.7	2.3
28	March 1997	140	2.58		
29	May 1997	120	2.73	11	2 U
30	September 1997	97	2.57		
31	December 1997	85	2.23	1.3	2.2
32	March 1998	71	1.86		
33	May 1998	51	1.91	1 U	2 U
34	November 1998	29	1.59	1 U	2 U
35	April 1999	27	1.48	1 U	1 U
36	October 1999	37	1.49	1 U	1 U

U = Indicates compound was not detected above the specified reporting limit.
J = Indicates that concentration is an estimate because all QC criteria were not met.

Table 5-2

Southern Gravel Aquifer, Downgradient Well
Monitoring Well 23 B

Report Number	Sampling Date	Chloride (mg/L)	Manganese (mg/L)	1,2 Di-chloroethane (ug/L)	Vinyl Chloride (ug/L)
RI Average		68	0.28	13	5
1	February 1990	140 J	0.37	11	1 U
2	May 1990	50	0.32	14	1 U
3	August 1991	61	0.48	10	1 U
4	January 1991	60	0.41	12	5
5	April 1991	58	0.34	10	4
6	July 1991	50	0.38	13	8
7	October 1991	61	0.35	11	7
8	March 1992	54	0.39	9	6
9	June 1992	51	0.39	12	7
10	September 1992	57.1	0.37	10	1 U
11	December 1992	43.4	0.403	9.4	5.3
12	April 1993	45.9	0.376	11	5.4
13	June 1993	47.1	0.372	8.9	5.6
14	September 1993	46.8	0.372	9.1	3.9
15	December 1993	44.5	0.361	9.3	4.9
16	March 1994	46.4	0.388		
17	May 1994	44.2	0.379	7	5
18	September 1994	43	0.434		
19	December 1994	42	0.35	8.7	1 U

20	March 1995	41	0.343		
21	May 1995	39	0.323	8.1	3.2
22	September 1995	39	0.309		
23	December 1995	40	0.311	7.1	3.5
24	March 1996	40	0.32		
25	May 1996	39	0.302	8.5	3
26	September 1996	40	0.317		
27	December 1996	38	0.304	6.8	2.7
28	March 1997	38	0.287		
29	May 1997	38	0.284	7.7	2.4
30	September 1997	36	0.312		
31	December 1997	35	0.278	9.7	4
32	March 1998	36	0.281		
33	May 1998	36	0.295	7	2.4
34	November 1998	36	0.275	6.6	2
35	April 1999	25	0.259	7.1	1.2
36	October 1999	28	0.258	7.5	2

U = Indicates compound was not detected above the specified reporting limit.
J = Indicates that concentration is an estimate because all QC criteria were not met.

Water Quality in the Sand Aquifer

Up Gradient Monitoring Wells

	Recent concentrations	MCL
MW 17-B		
1,1-dichloroethane	90 to 160 ug/L	800 ug/L*
1,1-dichloroethene	4.8 to 8.2 ug/L	7 ug/L
1,2-dichloroethane	8 to 12 ug/L	5 ug/L
MW 21-A		
1,1-dichloroethane	11 to 14 ug/L	800 ug/L*
1,1-dichloroethene	1.6 to 2.6 ug/L	7 ug/L
tetrachloroethene	24 to 35 ug/L	5 ug/L
trichloroethene	2.4 to 3.1 ug/L	5 ug/L

* 1,1-dichloroethane has no MCL. 800 ug/L is the MTCA Method B cleanup level in the 2/96 CLARC II table.

APPENDIX A
RESPONSIVENESS SUMMARY

MIDWAY LANDFILL

The responsiveness summary addresses public comments on the proposed plan for the remedial action under CERCLA for Midway Landfill NPL site in Kent, Washington. EPA's proposed plan was issued in May 2000 and the original public comment period ran from May 18 to June 16, 2000. The City of Seattle asked for an extension of the comment period on June 15, and the end of the public comment period was extended 30 days until July 17, 2000.

EPA's notices and fact sheets offered to hold a public meeting if sufficient interest was expressed by May 31, 2000. Only four requests were received and thus a public meeting was not held.

Written comments

Four written comment letters were received.

Comment: I received your fact sheet about the Midway Landfill in Kent Washington and I'm writing this letter to recommend that EPA implement their Limited Action Plan. Monitoring wells 23B and 29B are in a neighborhood and a church parking lot and should be monitored until signs of contamination no longer exist.

Response: Thank you for your comment and your support of EPA's preferred alternative.

Comment: The City of Des Moines has just completed a 5 year stream water quality monitoring program, which included the monitoring of McSorley Creek, the receiving stream of the runoff from Midway Landfill. The monitoring of the drainage outfall showed elevated levels of turbidity above water quality standards for a Class AA stream. McSorley Creek is a salmon-bearing stream containing coho and chum salmon, steelhead and cutthroat trout.

Although not conclusive, mainly because the treatment ponds on the Landfill also receive runoff from nearby Pacific Highway South, the turbidity may be the result of runoff from the Landfill clay cap. In order to fully remedy the situation, the City of Des Moines believes that the City of Seattle and the City of Kent, the owner of the Pacific Highway right-of-way in this area, need to jointly prepare a storm water pollution control plan for controlling the turbidity coming from this outfall. The City would like to have the opportunity to review such a plan.

The City of Des Moines also requests that, as part of EPA's monitoring proposal, Seattle continue to monitor the outfall for turbidity during storm events (on a periodic basis) and

provide the results of the tests to the City of Des Moines Engineering Department.

Response: EPA forwarded a copy of the City of Des Moines's letter to the City of Seattle and to Ecology. In response, the City of Seattle has begun discussions with both the City of Des Moines and the City of Kent to address the turbidity issue. The City of Seattle has sent the City of Des Moines all of the 1999 storm water detention pond monitoring data. This data, as well as the earlier years of data, appear to indicate that the main source of turbidity is the pond inflow from Pacific Highway South. Also, the City of Kent has now started to identify the City of Kent's options regarding requiring the private property owners to improve the quality of water discharged from their site.

EPA's description of the selected remedy (Section 11.2) acknowledges your request for additional monitoring. Details of the monitoring program will be established by Ecology and the City under their existing agreements, or, if necessary, unilaterally by Ecology using state regulatory authority.

Comment: Public Health-Seattle & King County supports EPA's limited action alternative. Outstanding groundwater issues in proximity to the landfill need to be addressed in order to protect both the environment and the public health of the impacted community.

Response: Thank you for your comment and your support of EPA's preferred alternative.

Comment: The City of Seattle supports the "limited action remedy" alternative proposed in the plan for the ROD.

Response: Thank you for your support of the limited action alternative.

Comment: The City has reached a tentative agreement with the Washington Department of Ecology ("Ecology") concerning this issue: Ecology will adopt the EPA ROD in its entirety, and the existing Consent Decree ("CD") between Ecology and the City will be formally amended to reflect EPA's limited action remedy. Thus, Ecology will not issue a Cleanup Action Plan ("CAP") for the Midway Landfill, since the ROD will serve that same purpose.

The City is pleased to announce this approach with Ecology because it will save both the City and Ecology the staff and budget resources necessary to issue and implement a separate CAP.

Response: When EPA was writing the proposed plan, Ecology had tentatively decided that Ecology would prepare a Cleanup Action Plan under MTCA. In accordance with EPA's understanding of Ecology's current position, the ROD has been changed to reflect the fact that after this ROD is completed, Ecology will use this EPA ROD, as allowed under MTCA. EPA has worked with Ecology to incorporate language into this ROD to reflect the necessary

MTCA requirements.

Comment: Proposed Plan page 1 – delete "Additional groundwater wells may need to be installed." The City has been monitoring groundwater through an existing network described in the CMP. It is the City's understanding that Ecology will review and approve the CMP, which sets forth the well network and monitoring schedule, as previously submitted. There is neither a pending requirement nor a technical justification for additional wells beyond the network in the submitted CMP.

Response: The details of the monitoring requirements have been set out by the City of Seattle in a compliance monitoring plan recently approved by Ecology. Through the procedures outlined in the agreements between Ecology and the City of Seattle, Ecology may require the City of Seattle to install and monitor new monitoring wells if needed.

Comment: Proposed Plan, page 2 – the last paragraph needs to be re-written to reflect that Ecology will adopt the ROD and will not issue a CAP.

Response: Please see EPA's response to the City's second comment, above.

Comment: Proposed plan, page 5 – add the word "final" to the first paragraph. The edited sentence will read: "This legal agreement set forth Ecology's determination that certain *final* remedial actions…." This edit reflects the wording of the existing CD that the remedial actions performed under the CD were final actions and not interim actions.

Response: The referenced sentence from the proposed plan has not been repeated in the ROD. A sentence that begins with the same phrase can be found in Section 2.1, but concludes with Ecology's determination that undertaking certain remedial actions would provide immediate protection to public health and the environment. This determination can be found in Paragraph 6, Page 9 of the 1990 Consent Decree.

Comment: Proposed plan, page 5 – re-write the paragraph above "Site Characteristics" to state that Ecology will amend the CD and adopt the ROD in its entirety, including the limited action remedy, which addresses long-term monitoring through the CMP.

Response: As a result of discussions and reviews between the time of the proposed plan and EPA's completion of the ROD, Ecology has decided to utilize the ROD as a Cleanup Action Plan pursuant to MTCA, and to approve the CMP. The ROD reflects these recent Ecology decisions.

Comment: Proposed plan, page 7 – third full paragraph from the top of the page. Delete "most likely" from the first sentence. Based on the voluminous technical data, groundwater contamination in the Sand Aquifer to the north, northwest and west of the landfill does not

come from the landfill. The present sentence is inaccurate.

Response: The phrase has been removed from the Summary of Landfill Conditions in Section 5.1.

Comment: Proposed plan, page 9 – Table 1. Proposed Groundwater Cleanup Standards. These proposed standards are acceptable to the City, with the exception of vinyl chloride. It is the City's understanding that Ecology will agree to use the practical quantification limit (PQL) for vinyl chloride as allowed by previously published Ecology directive.

Response: The concentration for determining compliance with the vinyl chloride cleanup level is 0.2 ug/L and has not changed from the proposed plan. This concentration reflects Ecology's consideration of the PQL issues for vinyl chloride, consistent with WAC 173-340-707 and the Department of Ecology's Implementation Memo No. 3, November 24, 1993.

Comment: Proposed plan, page 10 – the full paragraph under "#1 Monitor to." Delete this first sentence: "The monitoring will be done…" and insert a sentence that states that monitoring will be done pursuant to the CMP approved by Ecology.

Response: This sentence has been modified. The selected remedy reflects the City of Seattle and Ecology recent agreement on the details of the monitoring plan.

Comment: Proposed plan, page 11 – this sentence describing the third type of institutional control needs to be edited: The reference to notifying "local licensed well drillers" should be deleted because Ecology has dropped this requirement. Further, the City proposes satisfying the notification requirement to the health department and nearby water districts by sending them the annual groundwater monitoring reports. This paragraph should state this as well.

Response: Ecology has not dropped the requirement that local licensed well drillers be notified. However, this element of the selected remedy has been changed in two ways. First, the notice requirement has been re-focused to limit the notice to those licensed well drillers who have drilled wells in King County in the year just prior to the notice. This change reflects the competitive state-wide nature of the well drilling business while not requiring notices to drillers that may no longer be active. Second, Ecology will provide the list of names and addresses to the City of Seattle. Ecology's Office of Water Resources maintains a database that can provide this information.

The selected remedy allows the City to satisfy the notification requirements through distribution of the annual groundwater monitoring report, as long as the report contains the required information.

Comment: Proposed plan, page 12 – "State Acceptance" This sentence should be edited to

reflect that Ecology intends to accept the limited action remedy and adopt the ROD in its entirety.

Response: The ROD now says that Ecology concurs with the selected remedy and that Ecology has decided to utilize the ROD as a Cleanup Action Plan pursuant to WAC 173-340-360(13).

Comment: Proposed plan, page 13 – delete the last two sentences of the last paragraph, which begin: "For example, Ecology believes it may be necessary to identify…." As discussed above, it is the City's understanding that Ecology will approve the previously submitted CMP. This CMP sets out the scope of the City's groundwater monitoring obligation under the CD and amended CD. The CMP does not address groundwater entering the landfill from off-site sources located on the north and northwest of the landfill.

Response: The two sentences have been deleted from the description of the selected remedy. The intent of the sentences was to provide an example of the type of information that may be necessary if the City of Seattle wishes to demonstrate it is technically impracticable to meet the cleanup standards at every down gradient well because of the up gradient sources. If in the future the city would want to make a demonstration that it is technically impracticable to meet the cleanup standards, it is possible that EPA and Ecology would require monitoring that is not part of a monitoring plan already approved by Ecology. As stated in the ROD, in this situation, EPA and Ecology would work together with the City of Seattle to determine what information would be needed to support such a demonstration.

APPENDIX E – PRESS NOTICE

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EPA United States Environmental Protection Agency

EPA Reviews Cleanup at Midway Landfill Superfund Site in Kent– Public Input Welcome

The fourth Five-Year Review of the environmental cleanup at Midway Landfill, a Superfund site in Kent, Washington, is underway. EPA must review Superfund sites every five years when contaminants remain on site to ensure that the cleanup continues to protect human health and the environment.

The City of Seattle landfill accepted demolition materials, wood waste and industrial wastes from 1966 to 1983. Landfilling activities contaminated groundwater and air with hazardous chemicals. The cleanup for the Midway Landfill included gas and stormwater control, capping, and institutional controls. The cleanup was completed in 1992 and groundwater monitoring is ongoing. Much of the landfill area remains undeveloped and the Federal Way Link Extension light rail is being constructed on the east perimeter.

Feedback welcome: As someone from the area and familiar with the site, you may know things that can help our review team. If you have observations, information, or concerns about EPA's review, please contact Ashley Grompe, Project Manager at 800-424-4372 ext 1284, or 206-553-1284. More information and documents related to this site are available at: https://www.epa.gov/superfund/midway-landfill.

To submit comments: E-mail: grompe.ashley@epa.gov
Mail: Ashley Grompe, MS 12-D12-1, U.S. EPA Region 10, 1200 Sixth Avenue, Suite 155, Seattle, WA 98101.

TDD/TTY users may call the Federal Relay Service at 800-877-8339. Then please give the operator #206-553-1284.

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To submit comments: E-mail: grompe.ashley@epa.gov
Mail: Ashley Grompe, MS 12-D12-1, U.S. EPA Region 10, 1200 Sixth Avenue, Suite 155, Seattle, WA 98101.

TDD/TTY users may call the Federal Relay Service at 800-877-8339. Then please give the operator 206-553-1284.

APPENDIX F – SITE INSPECTION CHECKLIST

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: Midway Landfill	**Date of Inspection:** 3/5/2020
Location and Region: Seattle, WA 10	**EPA ID:** WAD980638910
Agency, Office or Company Leading the Five-Year Review: EPA	**Weather/Temperature:** 50s and overcast

Remedy Includes: (check all that apply)

- ☒ Landfill cover/containment
- ☐ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☒ Other: gas collection
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (check all that apply)

1. **O&M Site Manager** — Jeff Neuner (Seattle Public Utilities) (Name) | Program Manager (Title) | 3/5/2020 (Date)

Interviewed ☒ at site ☐ at office ☐ by phone : _____
Problems, suggestions ☐ Report attached: _____

2. **O&M Staff** — Jeff Neuner and Min-soon Yim (Seattle Public Utilities) (Name) | Program Managers (Title) | 3/5/2020 (Date)

Interviewed ☒ at site ☐ at office ☐ by phone : _____
Problems/suggestions ☐ Report attached: _____

EPA staff interviewed Jeff Neuner and Min-soon during 3/5/2020 site walk. Information gathered during interview is reflected in this FYR report. No significant deficiencies were noted.

3. **Local Regulatory Authorities and Response Agencies** (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices). Fill in all that apply.

Agency Washington State Department of Ecology
Contact Mark Adams (Name) | Cleanup Project Manager (Title) | 6/11/2020 (Date) | (425) 649-7107 (Phone No.)
Problems/suggestions ☐ Report attached: _____

EPA and Ecology have been in regular communication regarding upcoming site construction projects and will continue to coordinate based on 2020 FYR Recommendations.

Agency _____
Contact _____ Name | _____ Title | _____ Date | _____ Phone No.

Problems/suggestions ☐ Report attached: _____

4. **Other Interviews** (optional) ☒ Report attached: _____

Laura Lee and Lisa Gilbert from SPU contractor Parametrix were also present on the 3/5/2020 site inspection and made available for technical questions regarding landfill performance and groundwater conditions over the past years. No issues were noted during the interview.

III. ON-SITE DOCUMENTS AND RECORDS VERIFIED (check all that apply)

1. **O&M Documents**

☐ O&M manual	☒ Readily available	☒ Up to date	☐ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance logs	☒ Readily available	☒ Up to date	☐ N/A

Remarks: O&M manual and maintenance logs on-site

2. **Site-Specific Health and Safety Plan**	☒ Readily available	☒ Up to date	☐ N/A
☐ Contingency plan/emergency response plan	☐ Readily available	☐ Up to date	☒ N/A

Remarks: Jeff Neuner provided EPA and Ecology with H&S Update and Continuity of Operations Plan on 3/9/2020 to reflect current site conditions.

3. **O&M and OSHA Training Records**	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

4. **Permits and Service Agreements**

☒ Air discharge permit	☒ Readily available	☒ Up to date	☐ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits: _____	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

5. **Gas Generation Records**	☒ Readily available	☒ Up to date	☐ N/A

Remarks: _____

6. **Settlement Monument Records**	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

7. **Groundwater Monitoring Records**	☒ Readily available	☒ Up to date	☐ N/A

Remarks: _____

8. **Leachate Extraction Records**	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

9. **Discharge Compliance Records**

☐ Air	☐ Readily available	☐ Up to date	☐ N/A
☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

10. **Daily Access/Security Logs** ☒ Readily available ☒ Up to date ☐ N/A

Remarks:

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for state

☒ PRP in-house ☐ Contractor for PRP

☐ Federal facility in-house ☐ Contractor for Federal facility

☐ _____

2. **O&M Cost Records**

☐ Readily available ☐ Up to date

☐ Funding mechanism/agreement in place ☒ Unavailable

Original O&M cost estimate: _____ ☐ Breakdown attached

Total annual cost by year for review period if available

From: _____ To: _____ _____ ☐ Breakdown attached
Date Date Total cost

From: _____ To: _____ _____ ☐ Breakdown attached
Date Date Total cost

From: _____ To: _____ _____ ☐ Breakdown attached
Date Date Total cost

From: _____ To: _____ _____ ☐ Breakdown attached
Date Date Total cost

From: _____ To: _____ _____ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs during Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing Damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A

Remarks: _____

B. Other Access Restrictions

1. **Signs and Other Security Measures** ☐ Location shown on site map ☒ N/A

Remarks: _____

C. Institutional Controls (ICs)

1. **Implementation and Enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (e.g., self-reporting, drive by): _____

Frequency: _____

Responsible party/agency: _____

Contact _____ _____ _____ _____

Name Title Date Phone no.

Reporting is up to date ☐ Yes ☐ No ☒ N/A

Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☒ Yes ☐ No ☐ N/A

Violations have been reported ☐ Yes ☒ No ☐ N/A

Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks: _____

D. General

1. **Vandalism/Trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks: _____

2. **Land Use Changes On Site** ☐ N/A

Remarks: A light rail and highway expansion is planned for the eastern part of the Site by the end of 2020. WSDOT is working with the City and Ecology to ensure continued remedy protectiveness.

3. **Land Use Changes Off Site** ☒ N/A

Remarks: _____

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads Damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks: _____

B. Other Site Conditions

Remarks: _____

VII. LANDFILL COVERS ☒ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (low spots) ☐ Location shown on site map ☐ Settlement not evident

Area extent: Settlement was visible on the eastern part of the landfill outside of the fence. This area will be disturbed by the redevelopment project and will be addressed at that time. Depth: _____

Remarks: _____

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident

Lengths: _____ Widths: _____ Depths: _____

Remarks: _____

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident

Area extent: _____ Depth: _____

Remarks: _____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident

Area extent: there were some holes on the cap from moles burrowing Depth: _____

Remarks: _____

5. **Vegetative Cover** ☒ Grass ☒ Cover properly established

☒ No signs of stress ☐ Trees/shrubs (indicate size and locations on a diagram)

Remarks: _____

6. **Alternative Cover** (e.g., armored rock, concrete) ☒ N/A

Remarks: _____

7. **Bulges** ☐ Location shown on site map ☒ Bulges not evident

Area extent: _____ Height: _____

Remarks: _____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident

☐ Wet areas	☐ Location shown on site map	Area extent: _____
☒ Ponding	☐ Location shown on site map	Area extent: There was some ponding in the northwest part of the landfill, near the stormwater pond. Site operators indicated that this would flow into the stormwater pond if enough water was present.
☐ Seeps	☐ Location shown on site map	Area extent: _____
☐ Soft subgrade	☐ Location shown on site map	Area extent: _____

Remarks: _____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map

☒ No evidence of slope instability

Area extent: _____

Remarks: _____

B. Benches ☐ Applicable ☒ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

C. Letdown Channels ☒ Applicable ☐ N/A

(Channel lined with erosion control mats, riprap, grout bags or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** (Low spots) ☐ Location shown on site map ☒ No evidence of settlement

Area extent: _____ Depth: _____

Remarks: _____

2. **Material Degradation** ☐ Location shown on site map ☒ No evidence of degradation

Material type:_____ Area extent: _____

Remarks: _____

3. **Erosion** ☐ Location shown on site map ☒ No evidence of erosion

Area extent: _____ Depth: _____

Remarks: _____

4. **Undercutting** ☐ Location shown on site map ☒ No evidence of undercutting

Area extent: _____ Depth: _____

Remarks: _____

5. **Obstructions** Type: _____ ☒ No obstructions

☐ Location shown on site map Area extent: _____

Size: _____

Remarks: _____

6. **Excessive Vegetative Growth** Type: _____

☒ No evidence of excessive growth

☒ Vegetation in channels does not obstruct flow

☐ Location shown on site map Area extent: _____

Remarks: _____

D. Cover Penetrations ☒ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive

☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A

Remarks: _____

2. **Gas Monitoring Probes**

☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A

Remarks: _____

3. **Monitoring Wells** (within surface area of landfill)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☒ N/A

Remarks: _____

4. **Extraction Wells Leachate**

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☒ N/A

Remarks: _____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☒ N/A

Remarks: _____

E. Gas Collection and Treatment ☒ Applicable ☐ N/A

1. **Gas Treatment Facilities**

☒ Flaring ☐ Thermal destruction ☐ Collection for reuse

☒ Good condition ☐ Needs maintenance

Remarks: The gas extraction system has reached an asymptotic extraction stage. In the first quarter of 2018, the Startup, Shutdown, and Malfunction (SSM) Plan for the Landfill Flare Supplemented with Natural Gas (SPU 2018) was completed to comply with Condition 10 of NOCOA No. 11400 and the requirements of 40 Code of Federal Regulations (CFR) 63.6(e)(3).

2. **Gas Collection Wells, Manifolds and Piping**

☒ Good condition ☐ Needs maintenance

Remarks: _____

3. **Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings)

☐ Good condition ☐ Needs maintenance ☒ N/A

Remarks: _____

F. Cover Drainage Layer ☐ Applicable ☒ N/A

G. Detention/Sedimentation Ponds ☒ Applicable ☐ N/A

1. **Siltation** Area extent: _____ Depth: _____ ☒N/A

☐ Siltation not evident

Remarks: _____

2. **Erosion** Area extent: _____ Depth: _____

☒ Erosion not evident

Remarks: _____

3. **Outlet Works** ☒ Functioning ☐ N/A

Remarks: _____

4. **Dam** ☐ Functioning ☒ N/A

Remarks: _____

H. Retaining Walls ☐ Applicable ☒ N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps and Pipelines ☐ Applicable ☒ N/A

B. Surface Water Collection Structures, Pumps and Pipelines ☐ Applicable ☐ N/A

C. Treatment System ☐ Applicable ☒ N/A

D. Monitoring Data

1. **Monitoring Data**

☐ Is routinely submitted on time ☒ Is of acceptable quality

2. **Monitoring Data Suggests:**

☐ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining

E. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ All required wells located ☐ Needs maintenance ☒ N/A

Remarks: _____

X. OTHER REMEDIES

If there are remedies applied at the site and not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is designed to accomplish (e.g., to contain contaminant plume, minimize infiltration and gas emissions).

The remedy appears to be functioning as designed. Site waste has been capped, landfill gas is addressed via the flare station and site access is limited. Institutional controls are in place. The need to address 1,4-dioxane is currently under investigation and will be addressed as needed.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

O&M activities at the Site appear to be adequate. Site fencing, the cap, the gas collection infrastructure and flare station were all in good condition during the inspection. There were some limited areas of ponding and settlement on the cap that should continue to be monitored and corrective action taken as needed.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

N/A

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

N/A

APPENDIX G – SITE INSPECTION PHOTOS

Locked entrance gate on western side of landfill with signage

Landfill signage

Flare station

Flare station

Area of ponding on landfill that requires regrading

Gas collection infrastructure on landfill

Landfill, facing west

Landfill, facing east

Evidence of burrowing into landfill cap by rodents

Stormwater pond

Monitoring well MW-21


Stormwater conveyance on landfill

Monitoring well MW-14

Area of settlement on landfill cap in area of future redevelopment

Area of future rail line and highway expansion, facing north

Area of future rail line and highway expansion, facing south

Site fencing along I-5

Gate on eastern side of landfill

APPENDIX H – SELECT FIGURES FROM 2019 HYDROGEOLOGIC ASSESSMENT FOR COMPLIANCE OF 1,4-DIOXANE

Figure H-1: Operable or Potentially Operable Water Wells within one mile of the Site[5]

Operable or Potentially Operable Water Wells within one Mile of Midway Landfill

Well	Name	Well Type	Likely Aquifer	Use	Operable?	Hydraulic Position with Respect to Landfill
21C1	(b)(6)	Group D	SA	Not in use	Covered but operable	Cross-gradient
21F1	Marcus Whitman Church	Group D	SA	Not in use	Covered but operable	Cross-gradient to Downgradient
21P1	(b)(6)	Group D - Irrigation	UGA	Potentially in use	Likely	Upgradient
22A2	(b)(6)	Group D	AA	Potentially in use	New well	Cross-gradient to Downgradient
22H1	(b)(6)	Group D	SGA	In use	Yes	Cross-gradient to Downgradient
22J2	Kent Riverbend 1R	Group A - Irrigation	AA	In use	Yes	Downgradient
22Q1	(b)(6)	Group D - Irrigation	SGA	Potentially in use	Unknown	Downgradient
22Q2	(b)	Group D - Irrigation	SA	Potentially in use	Unknown	Downgradient
22Q3	(b)	Group D - Irrigation	SA	Potentially in use	Likely	Downgradient
27A3	(b)(6)	Group D - Irrigation	SGA	Not in use	Yes	Cross-gradient to Downgradient
28G6	(b)(6)	Group D	UGA	Not in use	Yes	Upgradient
29A2	(b)(6)	Group D - Irrigation	UGA	In use	Yes	Upgradient

AA = Alluvial Aquifer
SA = Sand Aquifer
SGA = Southern Gravel Aquifer
UGA = Upper Gravel Aquifer

[5] From section 5.3 of the Parametrix October 2019 Hydrogeologic Assessment for Compliance of 1,4-Dioxane.

Figure H-2: Water Wells in 1-Mile Radius of the Site[6]

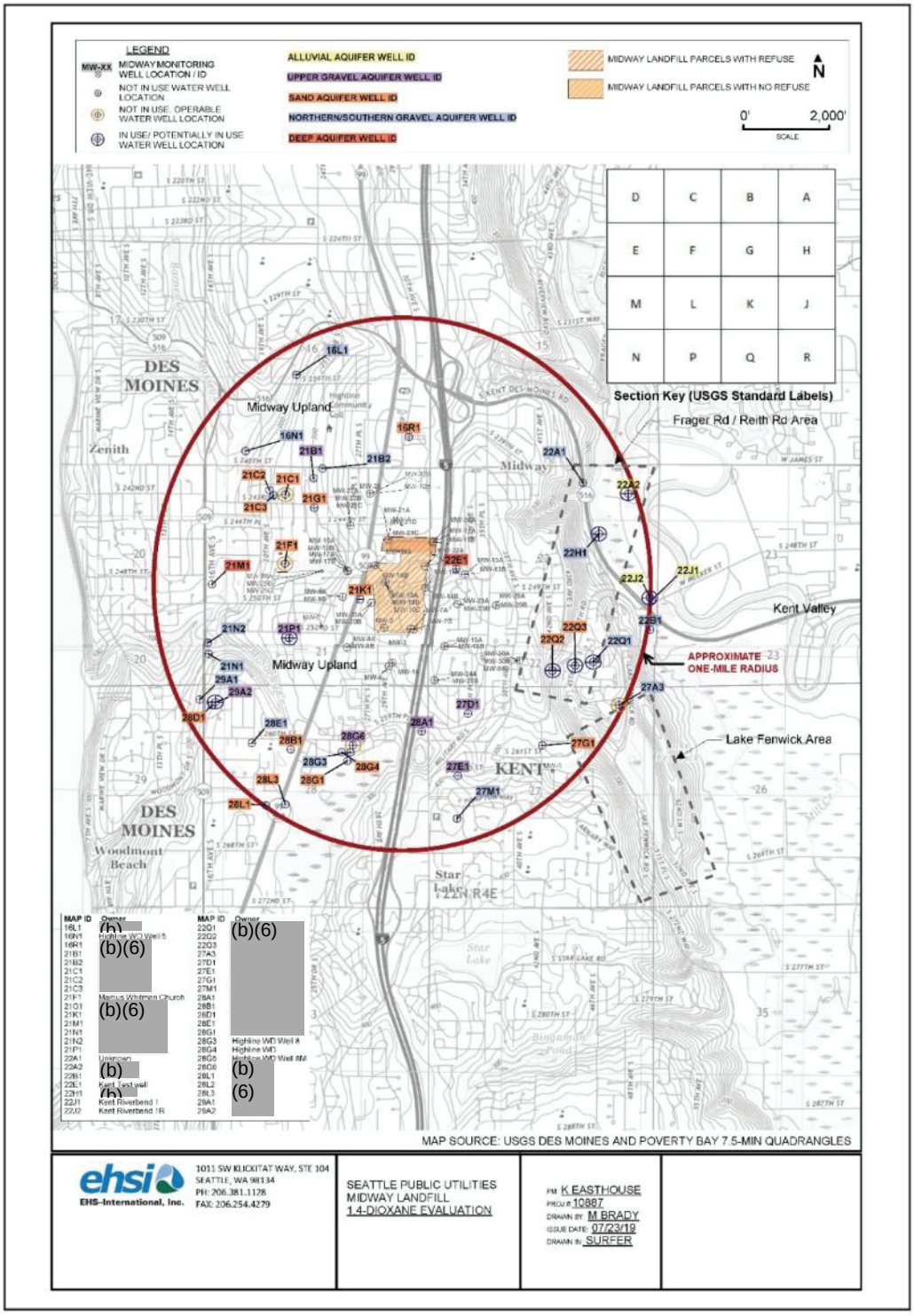

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Figure 9
1-Mile Radius Water Well Location Map
Midway Landfill
Kent, Washington

[6] Figure is from the Parametrix October 2019 Hydrogeologic Assessment for Compliance of 1,4-Dioxane.

APPENDIX I – DETAILED ARARS REVIEW

The 2000 ROD stated that for groundwater that is a potential future source of drinking water, the more stringent of federal drinking water standards (MCLs) and state cleanup standards under the MTCA are the cleanup levels. Table J-1 provides a comparison of the ROD cleanup goals to current standards. As noted in previous FYR reports, the current standard for vinyl chloride is less stringent than the cleanup goal. The current standard for manganese is more stringent than the cleanup goal. EPA will determine if the vinyl chloride and manganese cleanup goals should be changed to reflect current standards.

Table J-1: Groundwater COC ARARs Review

Groundwater COC	2000 ROD Cleanup Goal	Basis	Current Standard[a]	ARAR Change
1,2-DCA	5 µg/L	Federal Drinking Water Standard (MCL)	5 µg/L	None
Vinyl chloride	0.02 µg/L	MTCA Method B	0.029 µg/L[b]	Less stringent
Manganese	2.2 mg/L	MTCA Method B	0.75 mg/L	More stringent

Notes:

a. Current standards accessed at: https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations and https://www.ezview.wa.gov/Portals/_1987/Documents/Documents/CLARC_Master.pdf.

b. More stringent MTCA Method B value used between the cancer and noncancer cleanup levels.

APPENDIX J – POTENTIOMETRIC SURFACE MAPS, TIME-SERIES PLOTS AND GROUNDWATER MONITORING DATA

Exhibit J-1: Potentiometric Surface Maps[7]

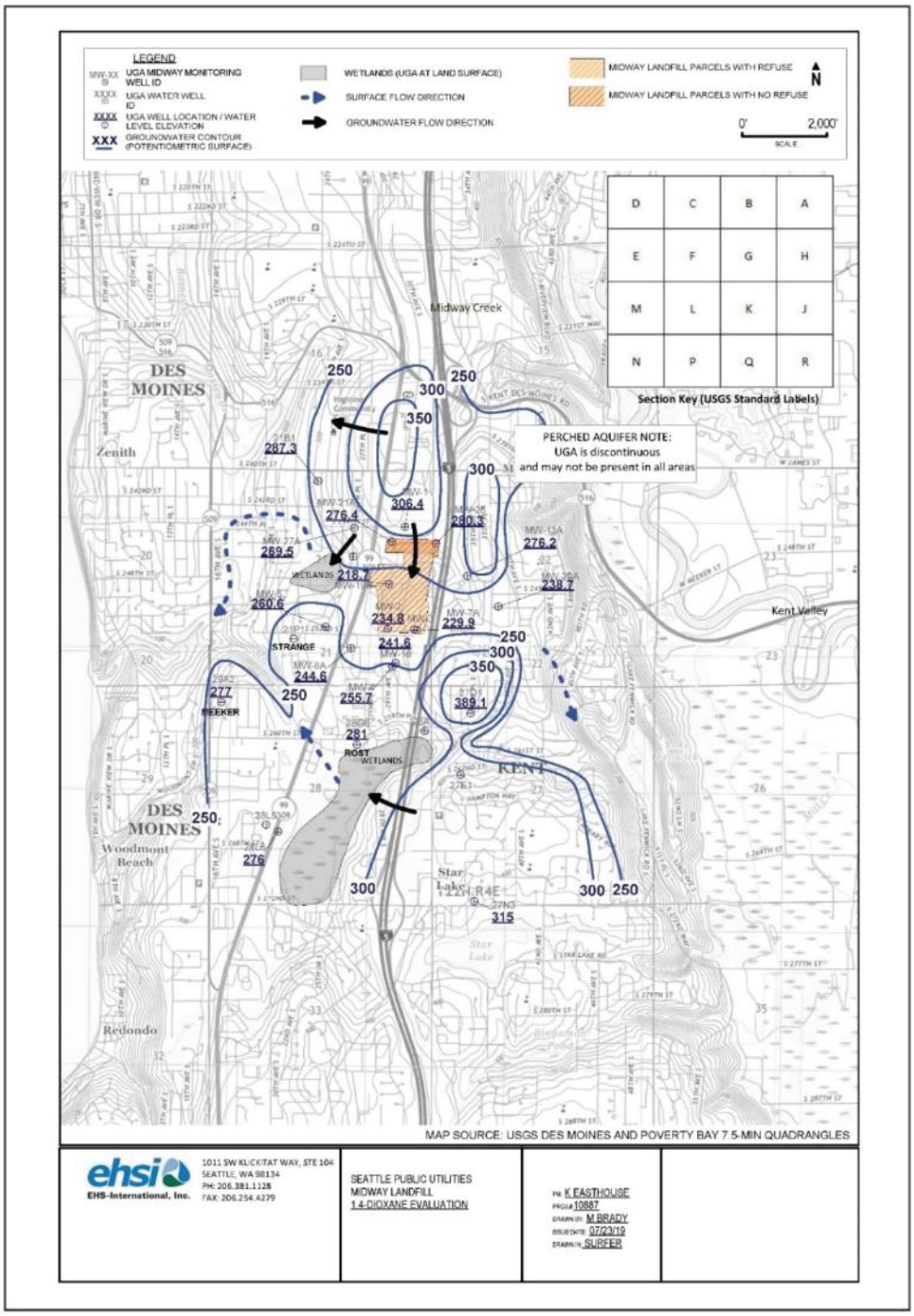

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Figure 11
Upper Gravel Aquifer
Potentiometric Surface Map
Midway Landfill
Kent, Washington

[7] Figures are from the Parametrix October 2019 Hydrogeologic Assessment for Compliance of 1,4-Dioxane.

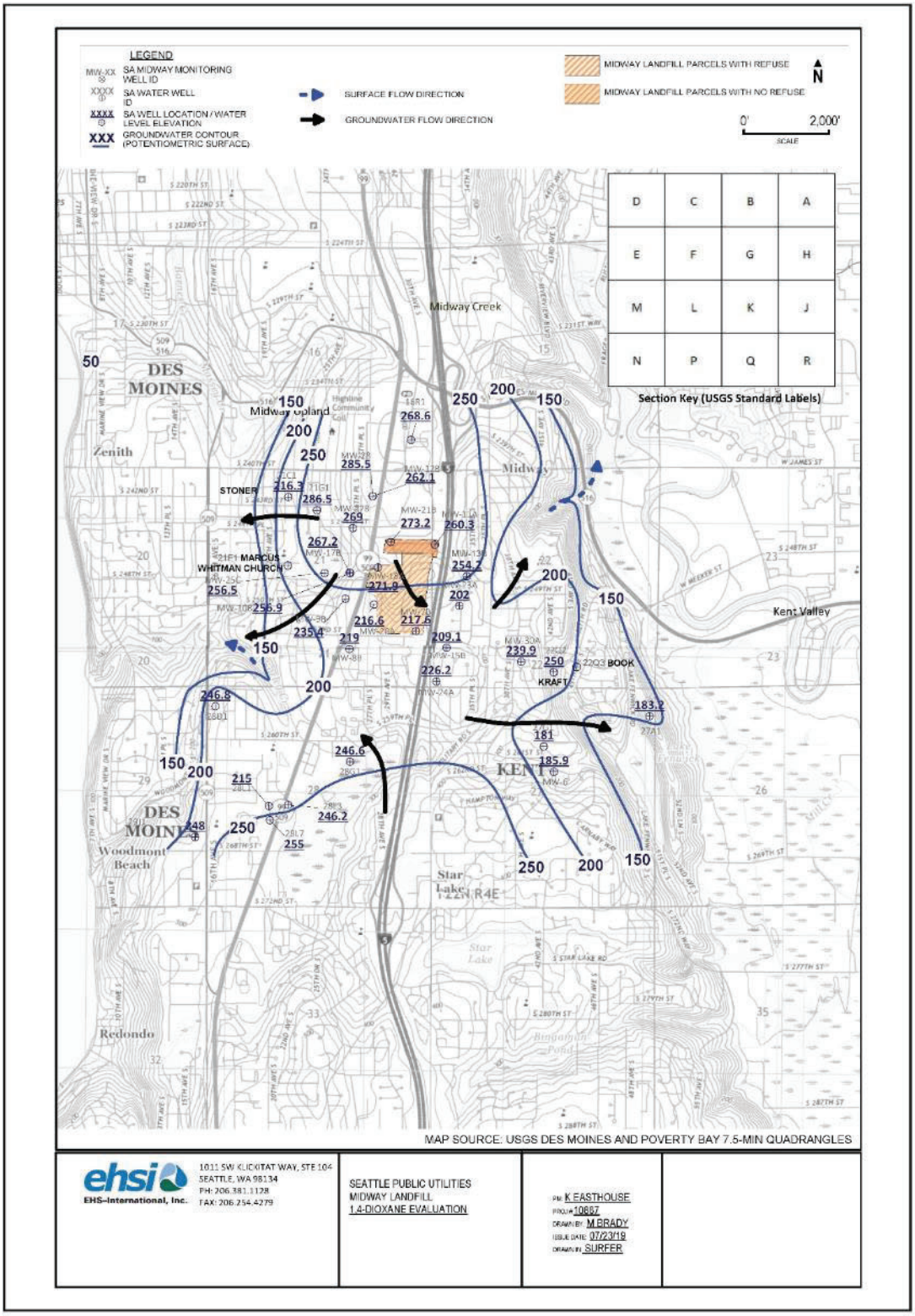

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Figure 12
Sand Aquifer
Potentiometric Surface Map
Midway Landfill
Kent, Washington

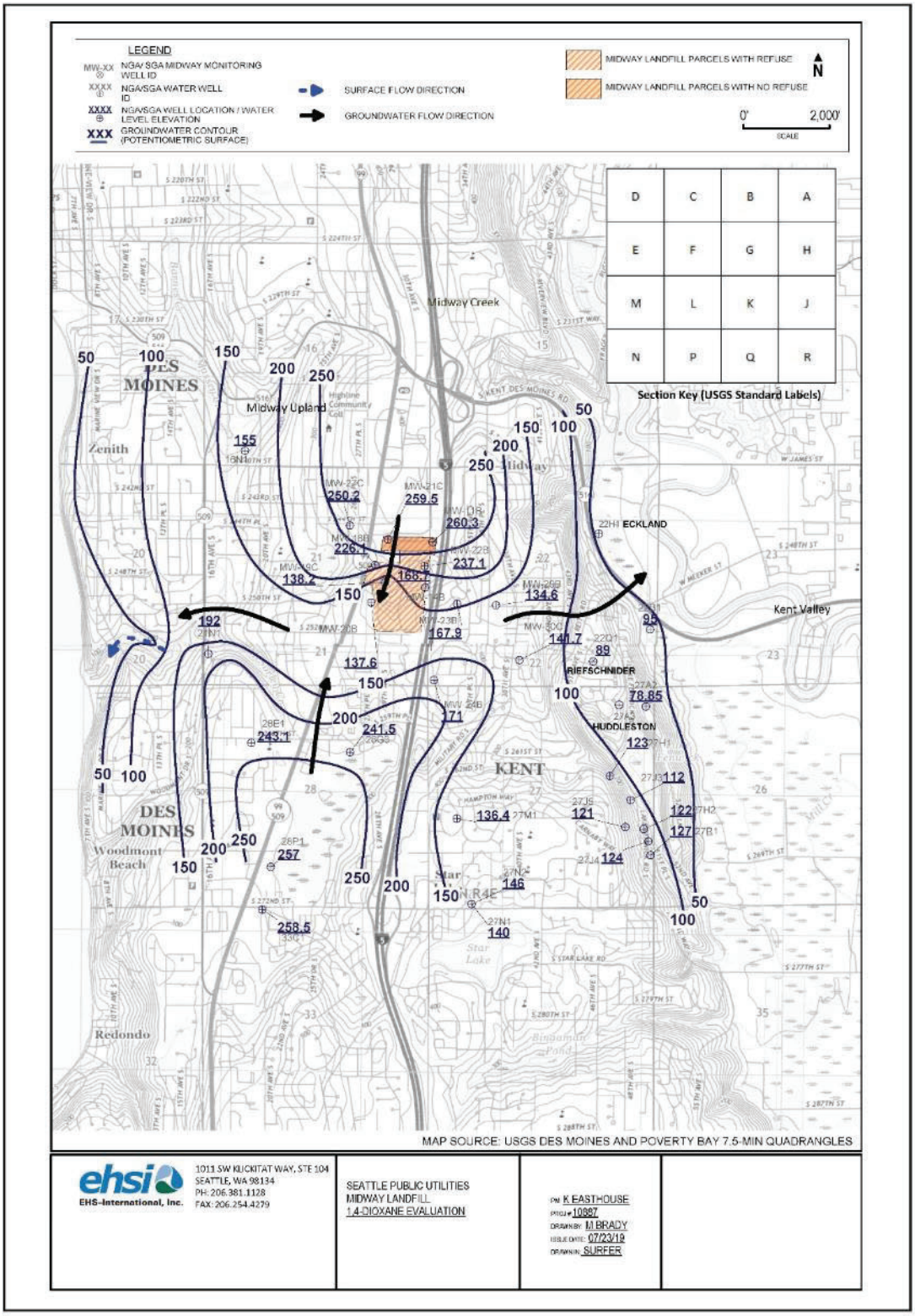

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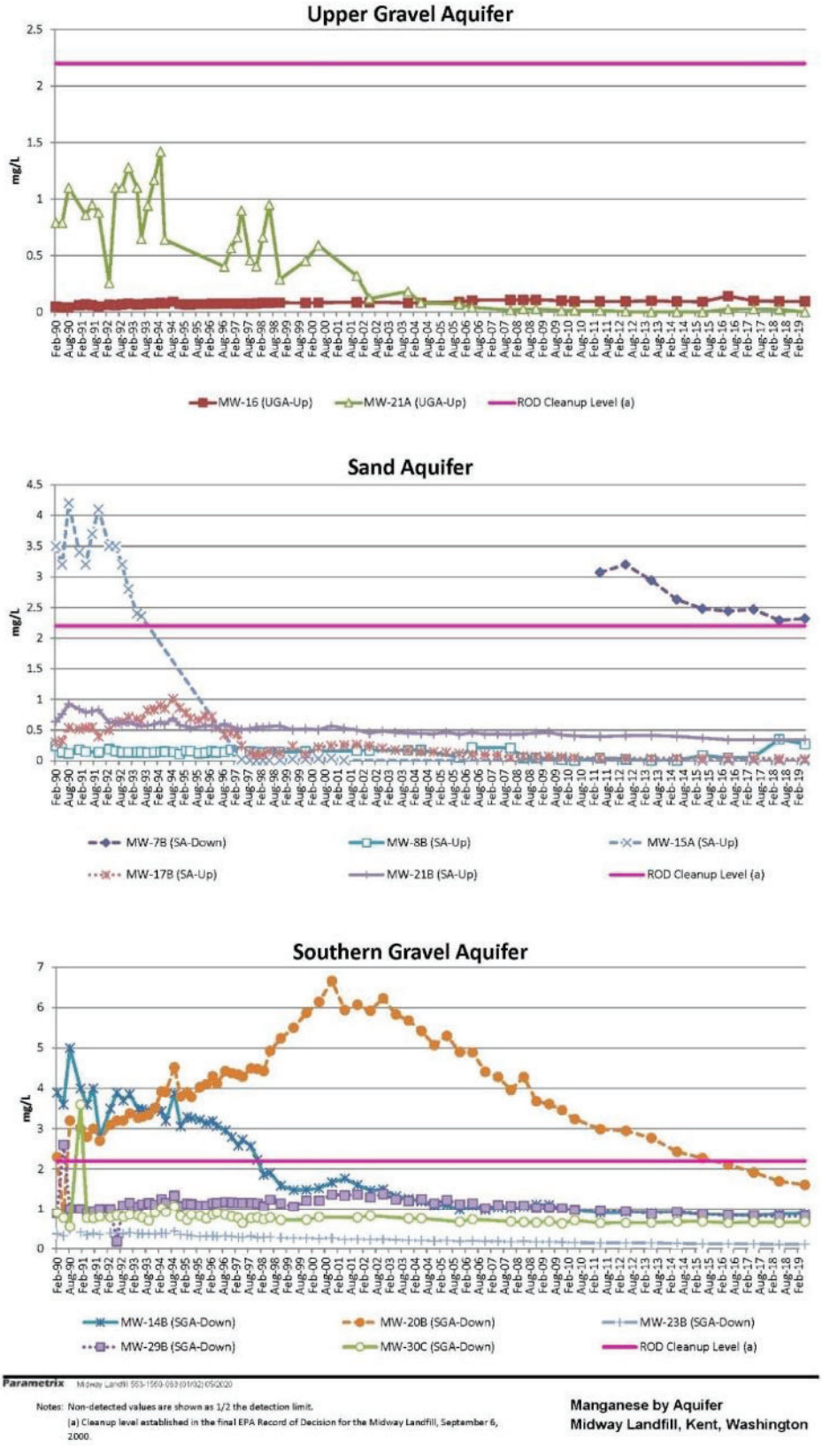
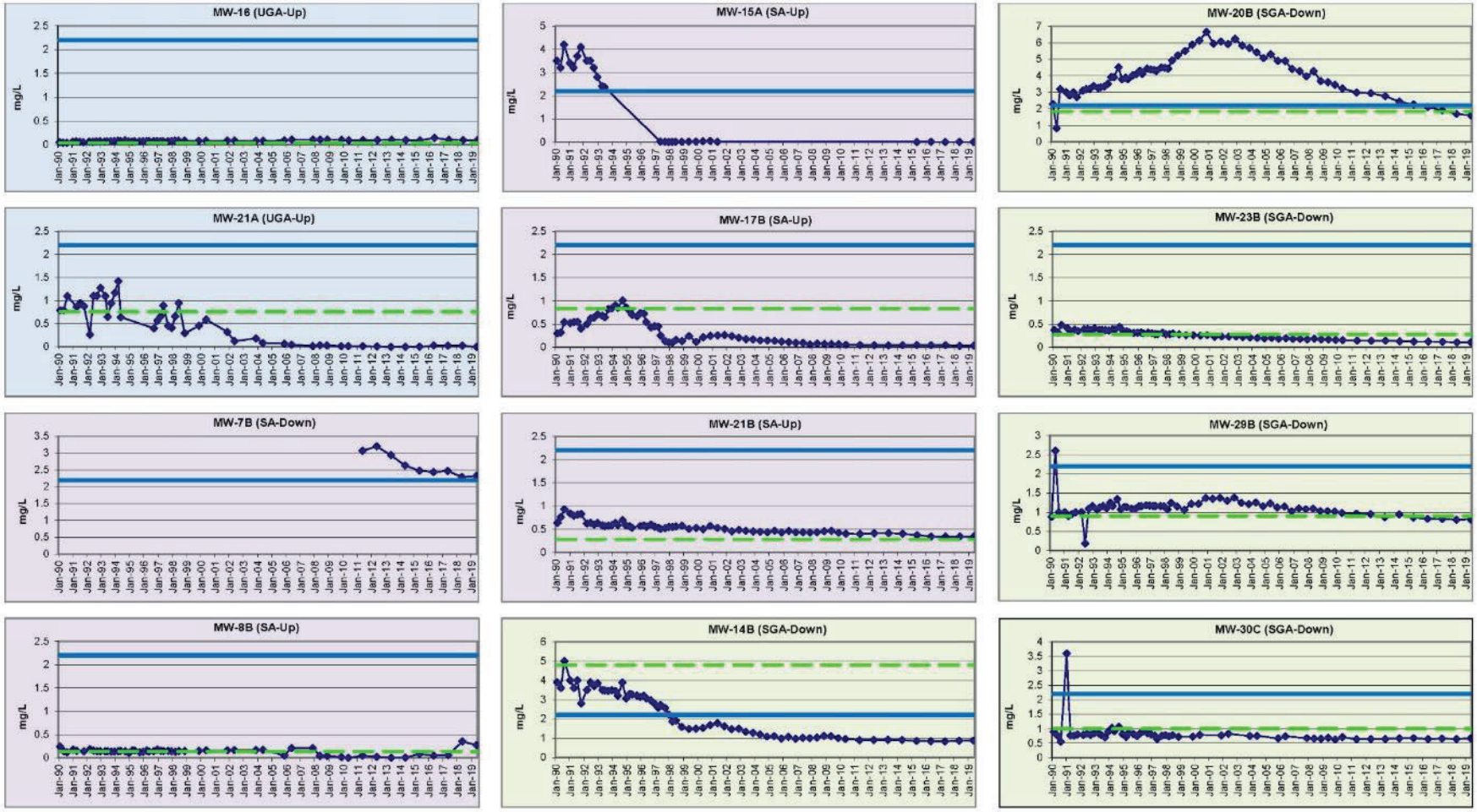
Figure 13
Northern and Southern Gravel Aquifer Potentiometric Surface Map
Midway Landfill
Kent, Washington

Exhibit J-2: Time Series Plots[8]



[8] Time-series plots are from the Remedial Action Status Report 2015-2019, except for the 1,4-dioxane time series plots, which are from the Parametrix October 2019 Hydrogeologic Assessment for Compliance of 1,4-Dioxane.



Parametrix Midway Landfill 553-1550-063 (2102) 05/2020

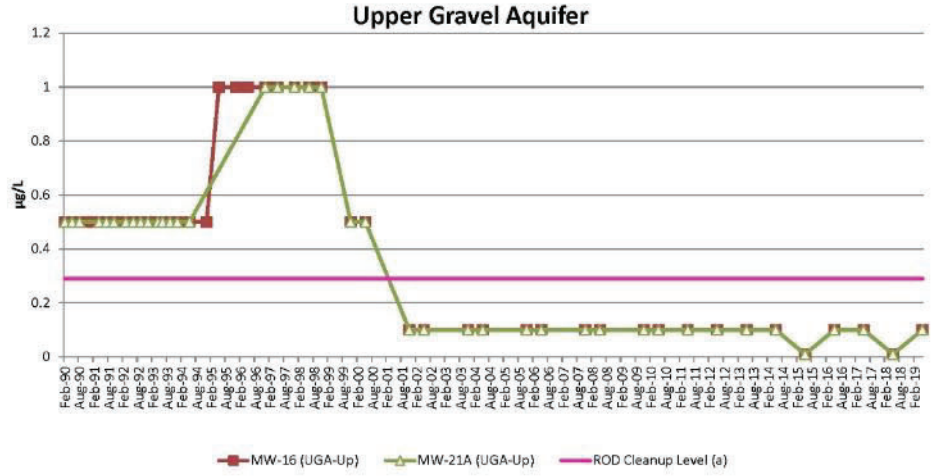
Notes: Non-detected values are shown as 1/2 the detection limit.

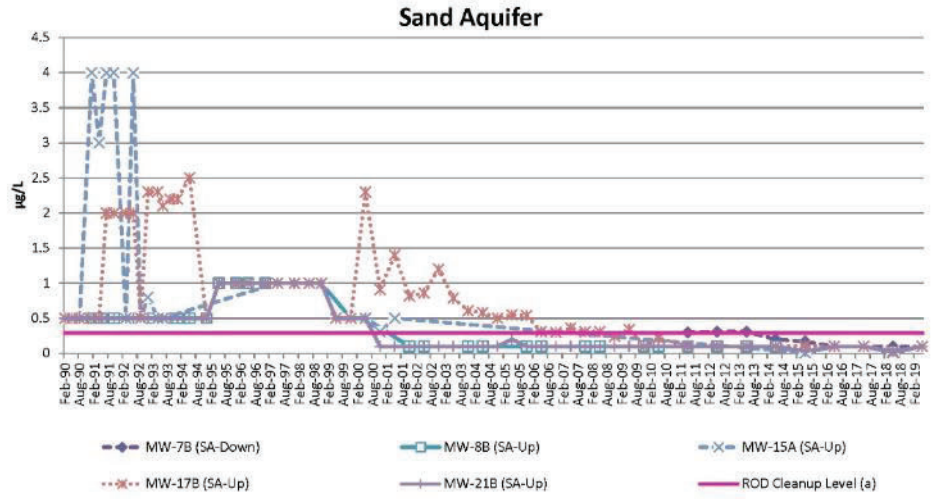
(a) Cleanup level established in the final EPA Record of Decision for the Midway Landfill, September 6, 2000.

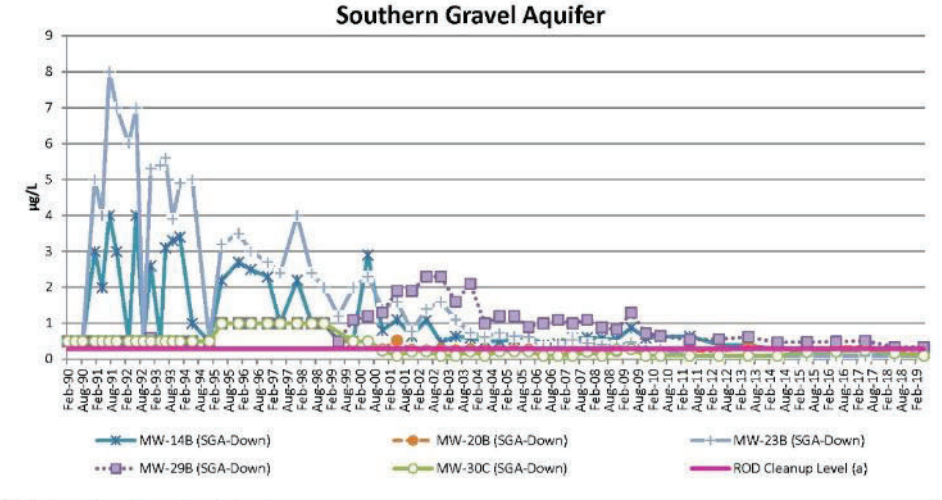
RI = Remedial Investigation

Upper Gravel Aquifer
Sand Aquifer
Southern Gravel Aquifer

Manganese
Midway Landfill, Kent, Washington



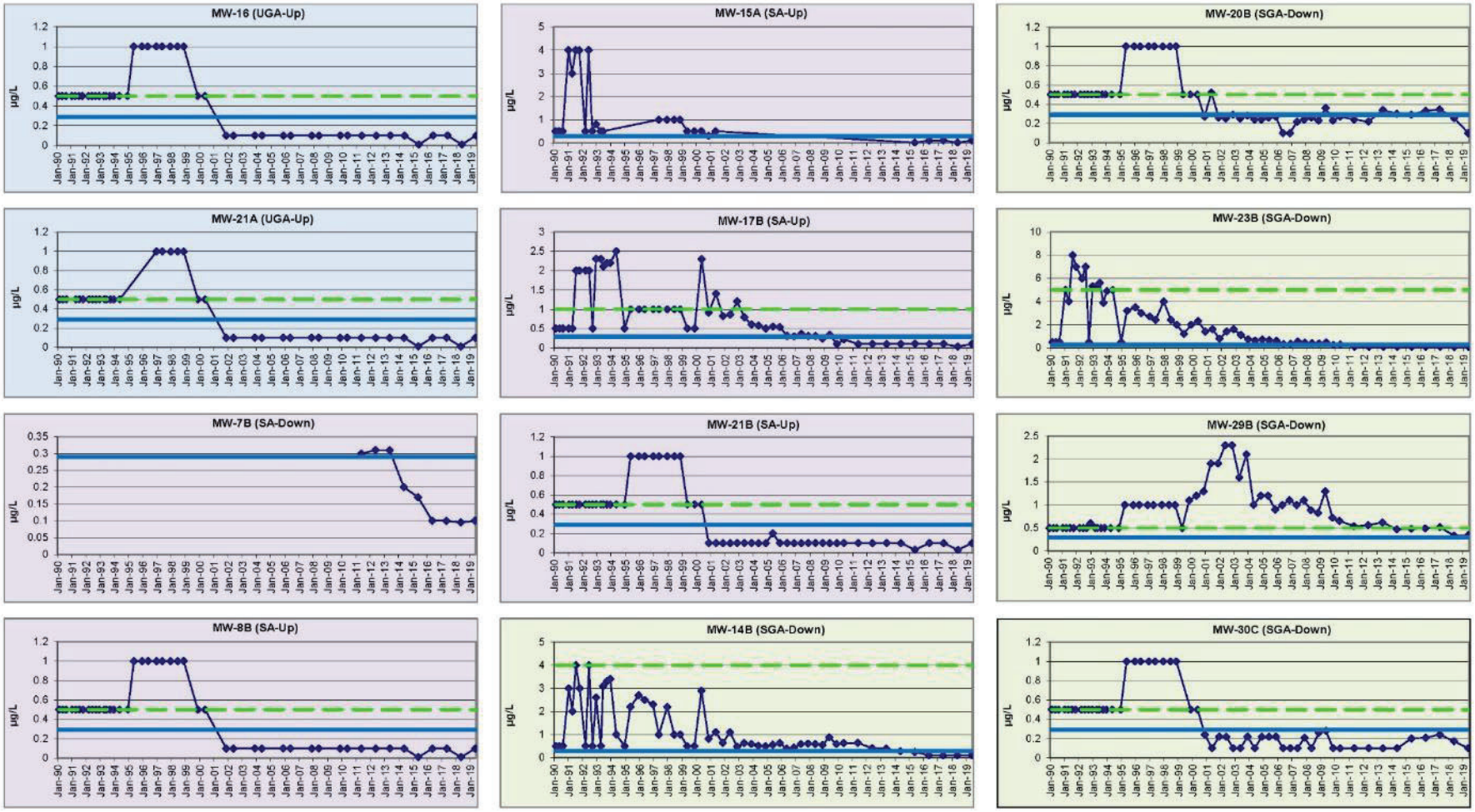




Parametrix Midway Landfill 555-1950-003 (01M02) 05/2020

Notes: Non-detected values are shown as 1/2 the detection limit.
(a) Cleanup level established in the final EPA Record of Decision for the Midway Landfill, September 6, 2000.

Vinyl Chloride by Aquifer
Midway Landfill, Kent, Washington

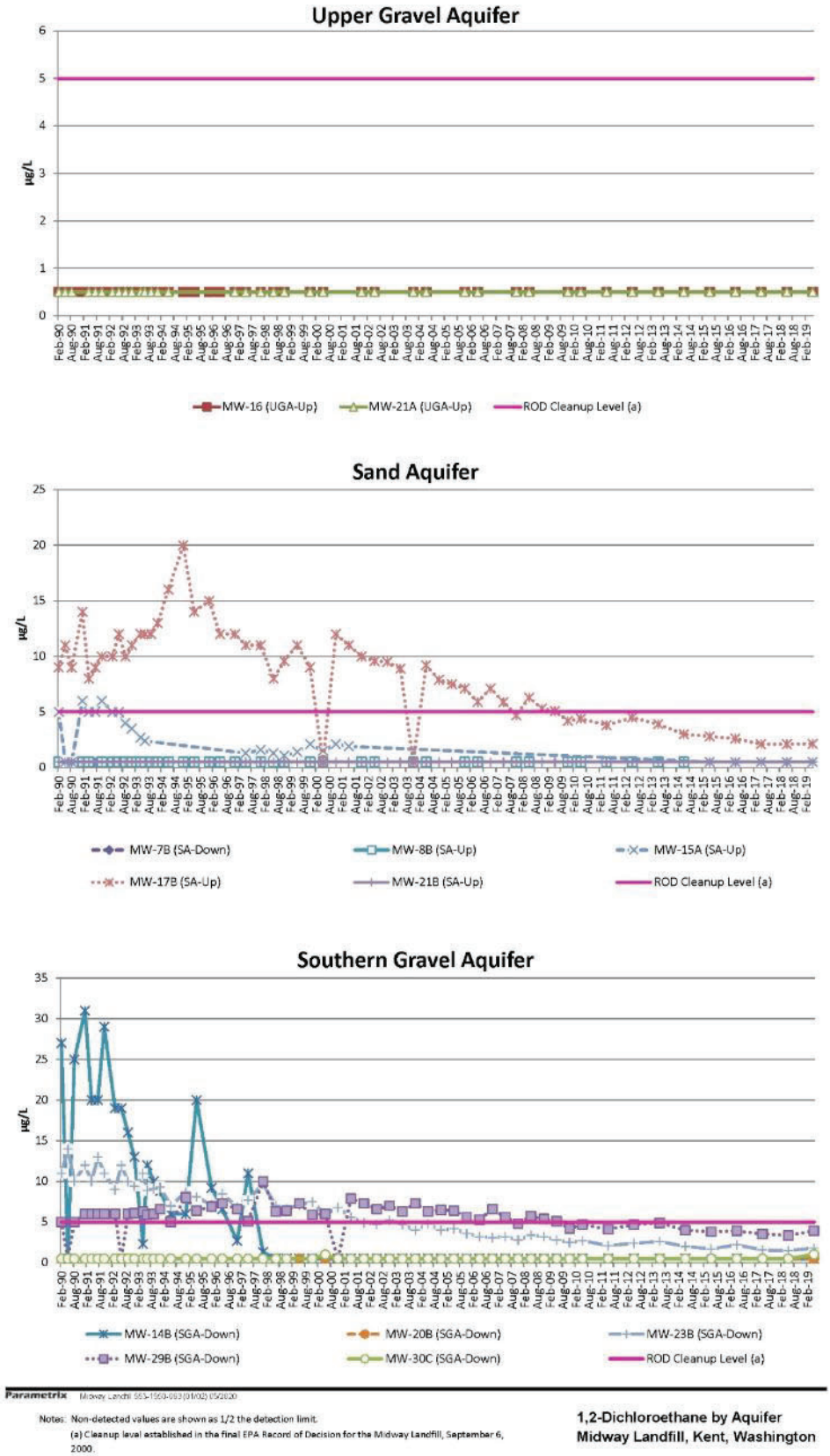


Parametrix Midway Landfill 553-1550-063 (01002) 05/2020

Notes:
Non-detected values are shown as 1/2 the detection limit.
(a) Cleanup level established in the final EPA Record of Decision for the Midway Landfill, September 6, 2000.
RI = Remedial Investigation

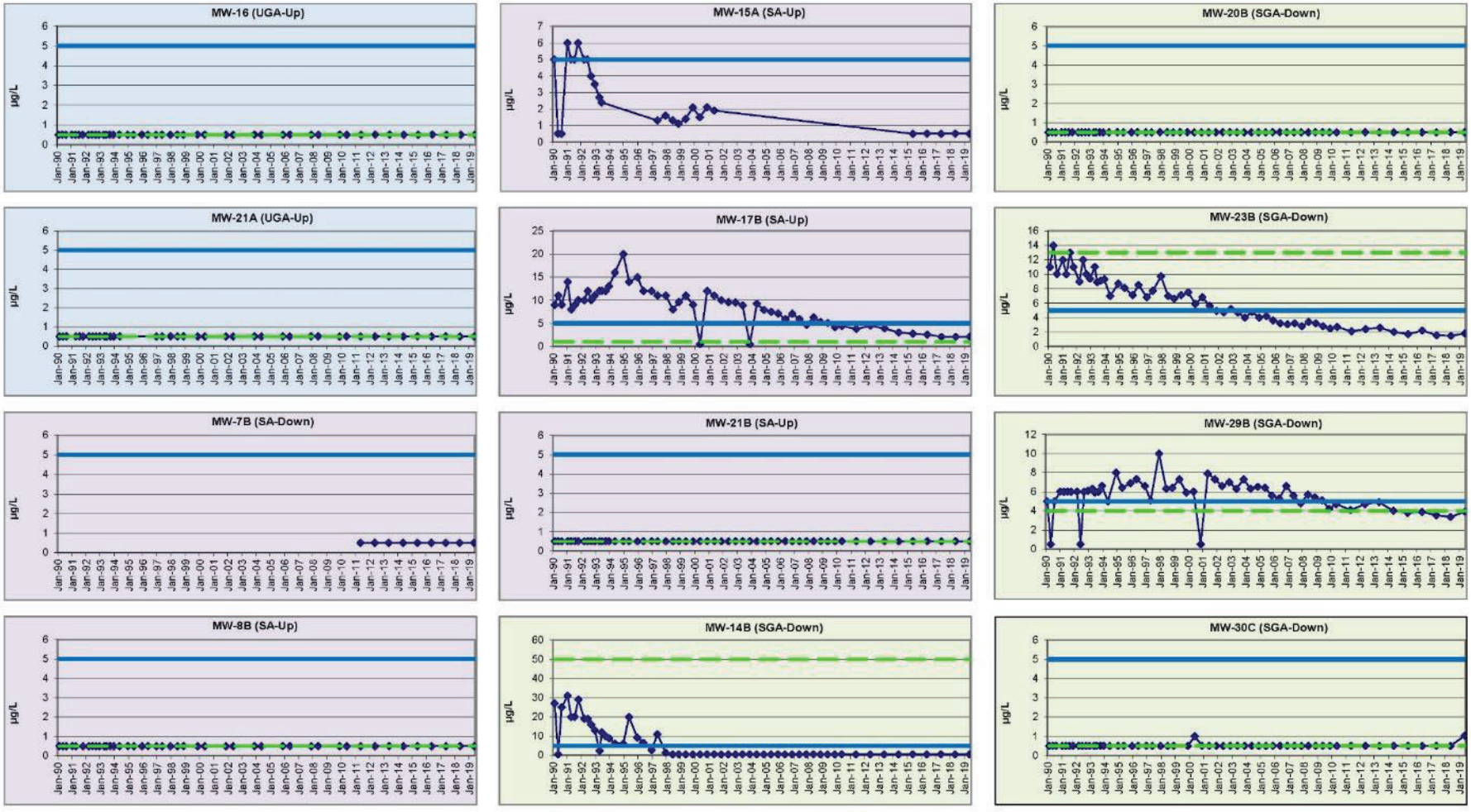
Upper Gravel Aquifer
Sand Aquifer
Southern Gravel Aquifer

Vinyl Chloride
Midway Landfill, Kent, Washington



Notes: Non-detected values are shown as 1/2 the detection limit.
(a) Cleanup level established in the final EPA Record of Decision for the Midway Landfill, September 6, 2000.

1,2-Dichloroethane by Aquifer
Midway Landfill, Kent, Washington

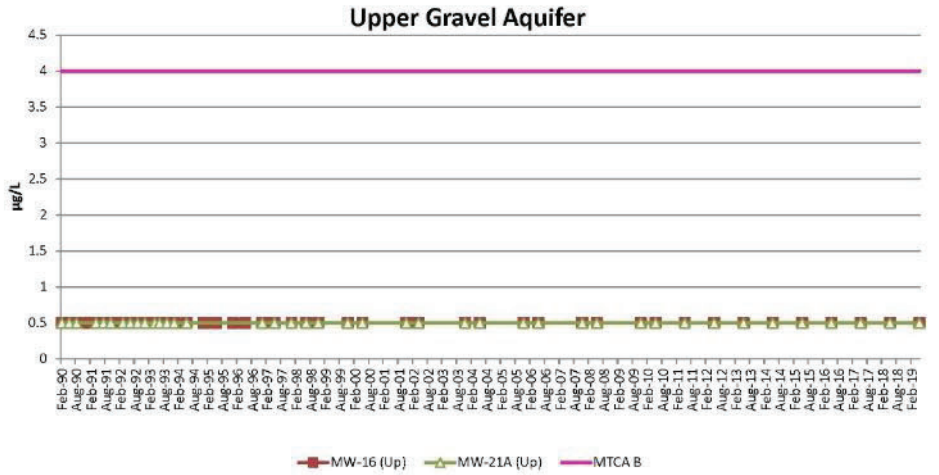


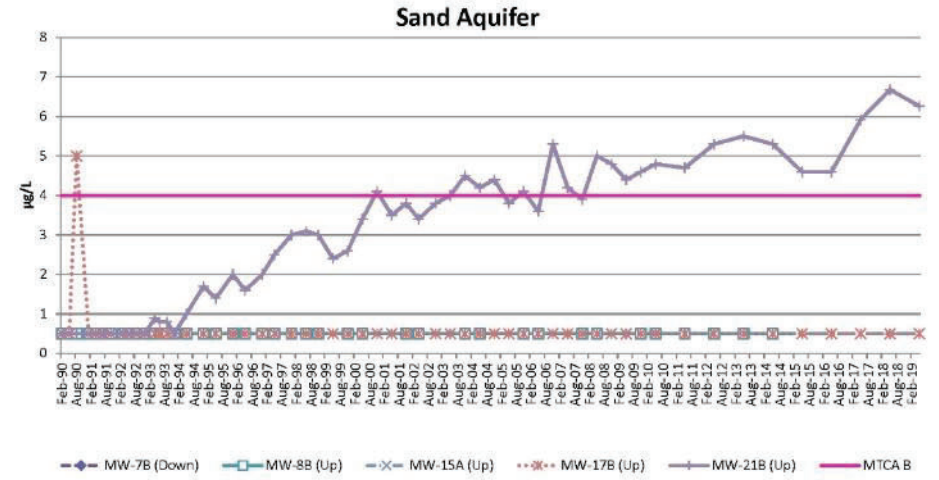
Parametrix Midway Landfill 553-1550-063 (01/02) 05/2020

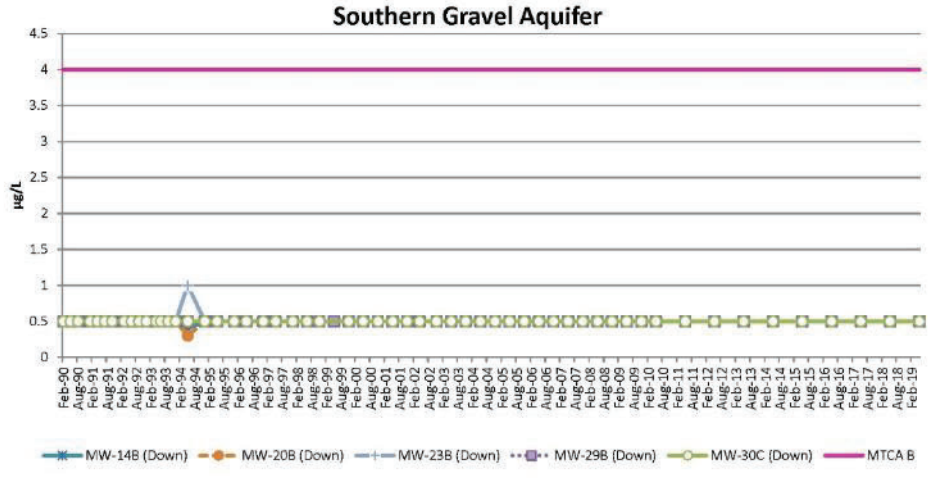
Notes: Non-detected values are shown as 1/2 the detection limit.
(a) Cleanup level established in the final EPA Record of Decision for the Midway Landfill, September 6, 2000.
RI = Remedial Investigation

Upper Gravel Aquifer
Sand Aquifer
Southern Gravel Aquifer

1,2-Dichloroethane
Midway Landfill, Kent, Washington



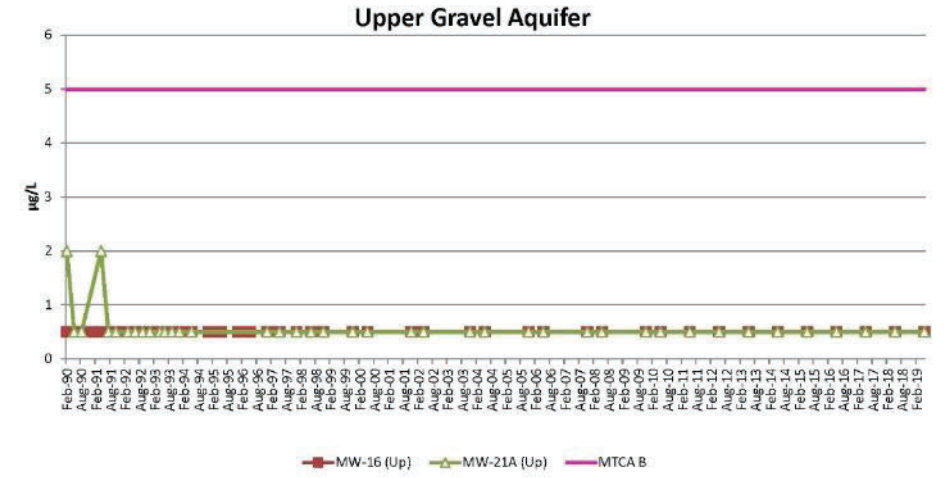


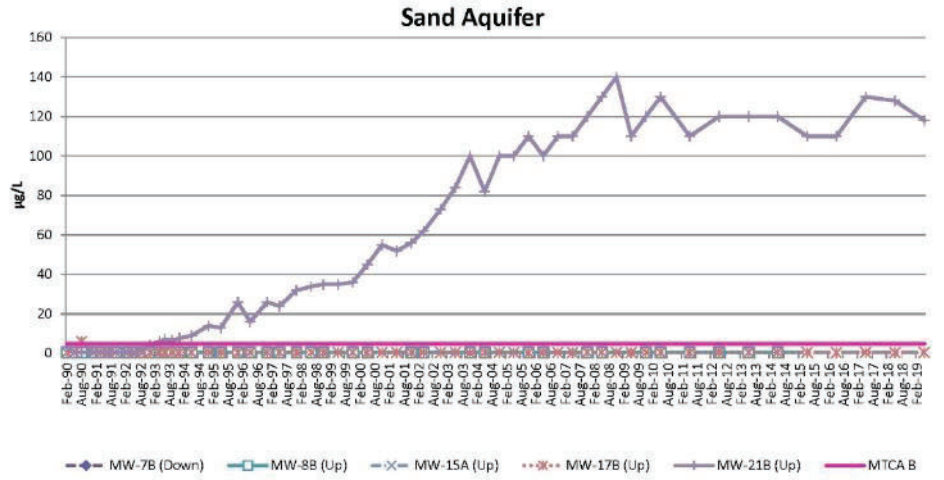


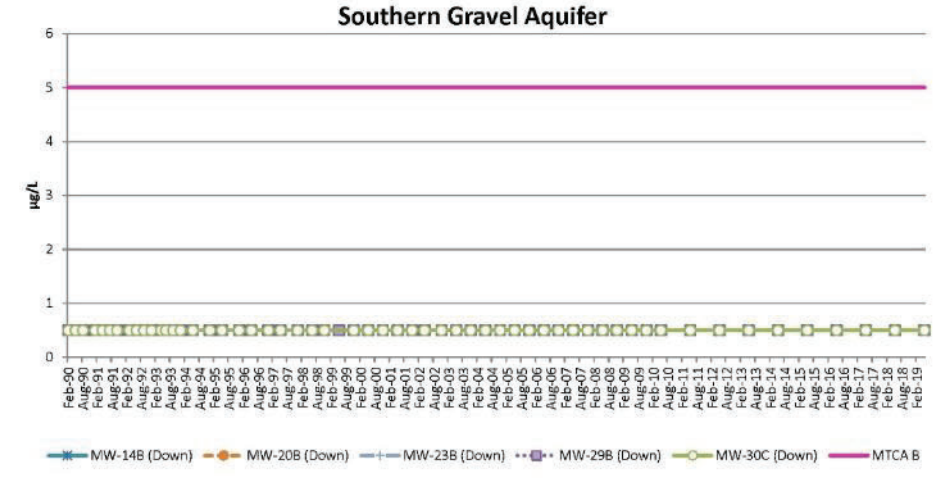
Parametrix Midway Landfill 555-1560-003 (01/02) 05/2020

Notes: Non-detected values are shown as 1/2 the detection limit.
MTCA B = Model Toxics Control Act (WAC 173-340) Method B cleanup level.

Trichloroethene by Aquifer
Midway Landfill, Kent, Washington







Parametrix Midway Landfill 555-1960-003 (01/02) 05/2020

Notes: Non-detected values are shown as 1/2 the detection limit.
MTCA B = Model Toxics Control Act (WAC 173-340) Method B cleanup level.

Tetrachloroethene by Aquifer
Midway Landfill, Kent, Washington

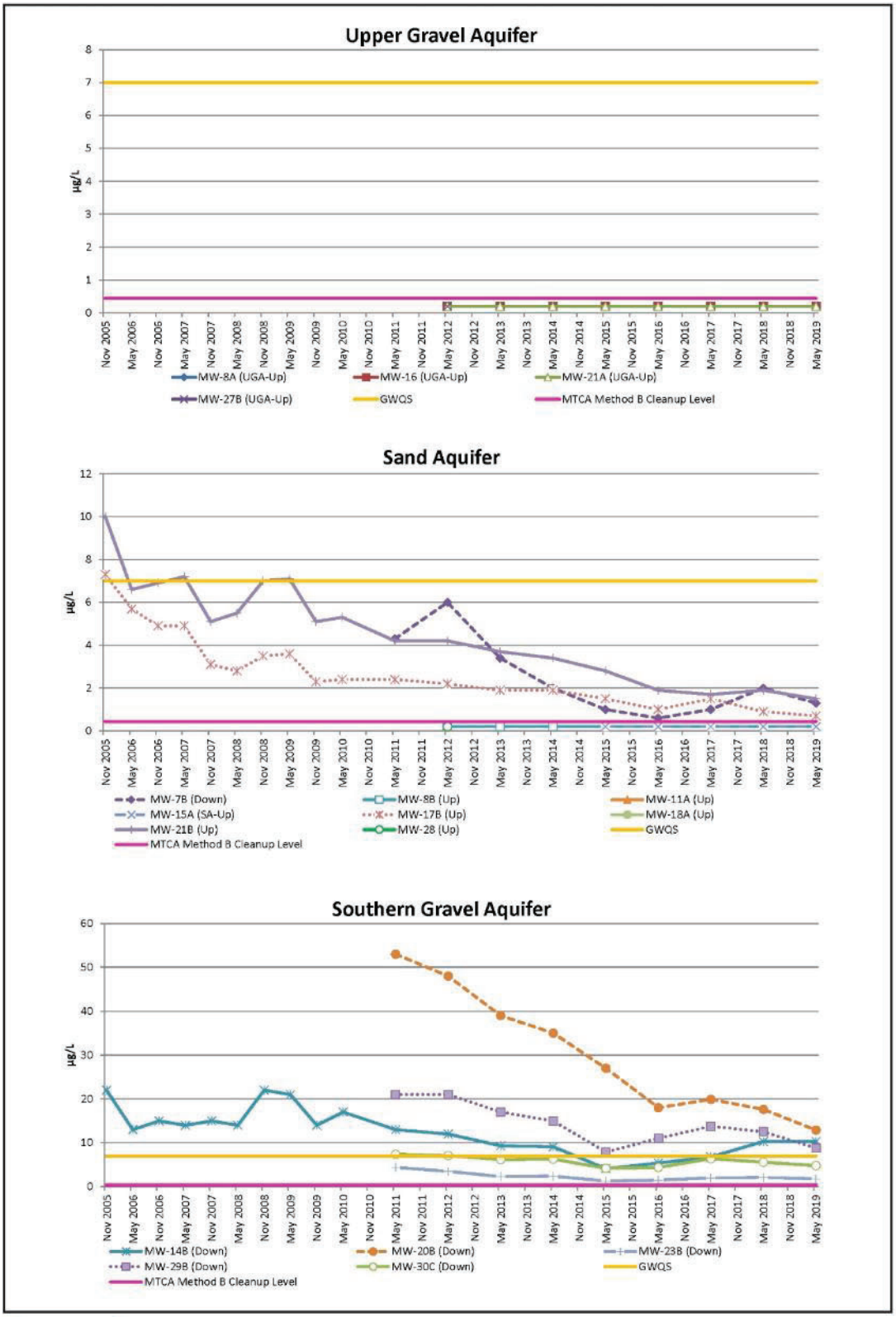


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Figure 4
1,4-Dioxane Results by Aquifer
Midway Landfill
Kent, Washington

Exhibit J-3: Groundwater Monitoring Data from FYR Period[9]

Table A3-1. Minimum Functional Standard and Organic Parameters in Groundwater, Midway Landfill, Upper Gravel Aquifer, 2015-2019 Data Summary

		MW-16 (UP)					MW-21A (UP)				
		R-62	R-63	R-64	R-65	R-66	R-62	R-63	R-64	R-65	R-66
Compound	Units	5/7/2015	5/5/2016	5/3/2017	5/8/2018	5/7/2019	5/5/2015	5/3/2016	5/2/2017	5/9/2018	5/8/2019
Field Parameters											
pH	s.u.	7.73	7.74	7.79	8.05	7.98	6.73	6.71	6.74	6.94	6.90
Conductivity	µmhos/cm	283	283	278	279.0	289.5	321	315	310	649.3	296.0
Temperature	C	11.8	11.8	12.0	11.8	11.8	11.4	12.0	11.9	11.9	11.6
Conventional Parameters											
Chloride	mg/L	7.9	7.9	8.09	7.82	7.89	6.0	6.0	6.15	5.78	5.77
Sulfate	mg/L	24.4	21.7	21.1	22.6	20.2	32.6	30.7	29.2	29.7	28.1
Chemical Oxygen Demand	mg/L	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Total Organic Carbon	mg/L	1.50 U	0.50 U	0.50 U	0.50 U	0.50 U	1.50 U	0.60	0.51	0.52	0.50 U
Dissolved Metals											
Iron	mg/L	0.13	0.14	0.116	0.0926	0.0816	0.05 U	0.08	0.0500 U	0.0500 U	0.0500 U
Manganese	mg/L	0.092	0.142	0.101	0.0943	0.0950	0.001	0.026	0.0274	0.0241	0.0010 U
Semi-Volatile Organics											
1,4-Dioxane	µg/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Volatile Organics											
Chloromethane	µg/L	1.0 U	2.5 U	2.50 U	2.50 U	2.50 U	1.0 U	2.5 U	2.50 U	2.50 U	2.50 U
Vinyl Chloride	µg/L	0.020 U	0.20 U	0.20 U	0.020 U	0.200 U	0.020 U	0.20 U	0.20 U	0.020 U	0.200 U
Bromomethane	µg/L	1.0 U	5.0 U	5.00 U	5.00 U	5.00 U	1.0 U	5.0 U	5.00 U	5.00 U	5.00 U
Chloroethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Trichlorofluoromethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.8 Q	1.87	1.58	1.00 U
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/L	2.0 U	1.0 U	1.00 U	1.00 U	1.00 U	2.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Acetone	µg/L	10 U	25 U	25.0 U	25.0 U	25.0 U	10 U	25 U	25.0 U	25.0 U	25.0 U
1,1-Dichloroethene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Methylene Chloride	µg/L	2.0 U	5.0 U	5.00 U	5.00 U	5.00 U	2.0 U	5.0 U	5.00 U	5.00 U	5.00 U
Carbon Disulfide	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
trans-1,2-Dichloroethene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Vinyl Acetate	µg/L	5.0 U	1.0 U	1.00 U	1.00 U	1.00 U	5.0 U	1.0 U	1.00 U	1.00 U	1.00 U
1,1-Dichloroethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
2-Butanone	µg/L	5.0 U	25 U	25.0 U	25.0 U	25.0 U	5.0 U	25 U	25.0 U	25.0 U	25.0 U
cis-1,2-Dichloroethene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.12	1.00 U
Chloroform	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
1,1,1-Trichloroethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Carbon Tetrachloride	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
1,2-Dichloroethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Benzene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Trichloroethene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
1,2-Dichloropropane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Bromodichloromethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
2-Chloroethyl vinyl ether	µg/L	5.0 U	5.0 U	5.00 U	5.00 U	5.00 U	5.0 U	5.0 U	5.00 U	5.00 U	5.00 U
4-Methyl-2-Pentanone (MIBK)	µg/L	5.0 U	25 U	25.0 U	25.0 U	25.0 U	5.0 U	25 U	25.0 U	25.0 U	25.0 U
cis-1,3-Dichloropropene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Toluene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
trans-1,3-Dichloropropene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
2-Hexanone	µg/L	5.0 U	25 U	25.0 U	25.0 U	25.0 U	5.0 U	25 U	25.0 U	25.0 U	25.0 U
1,1,2-Trichloroethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Tetrachloroethene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Dibromochloromethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Chlorobenzene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Ethylbenzene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
m,p-Xylene	µg/L	2.0 U	2.0 U	1.00 U	2.00 U	2.00 U	2.0 U	2.0 U	1.00 U	2.00 U	2.00 U
o-Xylene	µg/L	1.0 U	1.0 U	2.00 U	1.00 U	1.00 U	1.0 U	1.0 U	2.00 U	1.00 U	1.00 U
Styrene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Bromoform	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
1,1,2,2-Tetrachloroethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U

[9] Groundwater monitoring data tables are from the Remedial Action Status Report 2015-2019.

Table A3-2. Minimum Functional Standard and Organic Parameters in Groundwater, Midway Landfill, Sand Aquifer, 2015-2019 Data Summary

		MW-7B (DOWN)					MW-8B (UP)						MW-15A (DOWN)				
		R-62	R-63	R-64	R-65	R-66	R-62	R-63		R-64	R-65	R-66	R-62	R-63	R-64	R-65	R-66
Compound	Units	5/6/2015	5/4/2016	5/3/2017	5/8/2018	5/7/2019	5/6/2015	5/4/2016	Duplicate (MW-35) 5/4/2016	5/4/2017	5/8/2018	5/7/2019	5/7/2015	5/5/2016	5/4/2017	5/7/2018	5/6/2019
Field Parameters																	
pH	s.u.	6.73	6.68	6.75	6.94	6.90	6.54	6.77	--	6.83	7.76	7.65	6.64	6.58	6.70	6.85	6.65
Conductivity	µmhos/cm	528	506	492	488.8	478.6	177	213	--	205	271.6	281.0	347	363	391	406.3	390.2
Temperature	C	13.0	12.9	13.5	13.4	13.4	11.4	11.7	--	11.9	11.8	12.1	12.2	12.1	12.3	12.3	12.9
Conventional Parameters																	
Chloride	mg/L	12.7	11.6	11.6	14.9	13.1	6.3	8.0	7.9	8.81	8.81	9.22	5.8	5.3	5.78	5.99	5.96
Sulfate	mg/L	33.4	28.7	27.3	28.8	27.0	23.0	27.3	27.3	25.3	30.6	29.8	29.4	26.7	24.9	24.2	26.9
Chemical Oxygen Demand	mg/L	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	20.9	19.6	22.1	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Total Organic Carbon	mg/L	1.50 U	0.96	1.02	0.93	0.80	4.10	1.66	2.64	1.26	0.50 U	0.50 U	1.50 U	0.79	0.75	0.88	0.60
Dissolved Metals																	
Iron	mg/L	2.74	2.66	2.27	1.96	1.76	1.29	0.11	0.11	0.0500 U	0.0740	0.0677	0.05 U	0.05 U	0.0500 U	0.02 U	0.0500 U
Manganese	mg/L	2.48	2.44	2.47	2.29	2.32	0.087	0.047	0.049	0.0614	0.351	0.275	0.002	0.002	0.0010 U	0.00273	0.0010 U
Semi-Volatile Organics																	
1,4-Dioxane	µg/L	1.0	0.6	1.0	2.0	1.3	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Volatile Organics																	
Chloromethane	µg/L	1.0 U	2.5 U	2.50 U	2.50 U	2.50 U	1.0 U	2.5 U	2.5 U	2.50 U	2.50 U	2.50 U	1.0 U	2.5 U	2.50 U	2.50 U	2.50 U
Vinyl Chloride	µg/L	0.17	0.20 U	0.20 M, U	0.0954	0.200 U	0.020 U	0.20 U	0.20 U	0.20 U	0.020 U	0.200 U	0.020 U	0.20 U	0.20 U	0.020 U	0.200 U
Bromomethane	µg/L	1.0 U	5.0 U	5.00 U	5.00 U	5.00 U	1.0 U	5.0 U	5.0 U	5.00 U	5.00 U	5.00 U	1.0 U	5.0 U	5.00 U	5.00 U	5.00 U
Chloroethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Trichlorofluoromethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/L	2.0 U	1.0 U	1.00 U	1.00 U	1.00 U	2.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	2.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Acetone	µg/L	10 U	25 U	25.0 U	25.0 U	25.0 U	10 U	25 U	25 U	25.0 U	25.0 U	25.0 U	10 U	25 U	25.0 U	25.0 U	25.0 U
1,1-Dichloroethene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Methylene Chloride	µg/L	2.0 U	5.0 U	5.00 U	5.00 U	5.00 U	2.0 U	5.0 U	5.0 U	5.00 U	5.00 U	5.00 U	2.0 U	5.0 U	5.00 U	5.00 U	5.00 U
Carbon Disulfide	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
trans-1,2-Dichloroethene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Vinyl Acetate	µg/L	5.0 U	1.0 U	1.00 U	1.00 U	1.00 U	5.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	5.0 U	1.0 U	1.00 U	1.00 U	1.00 U
1,1-Dichloroethane	µg/L	1.6	1.5	1.36	1.25	1.35	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
2-Butanone	µg/L	5.0 U	25 U	25.0 U	25.0 U	25.0 U	5.0 U	25 U	25 U	25.0 U	25.0 U	25.0 U	5.0 U	25 U	25.0 U	25.0 U	25.0 U
cis-1,2-Dichloroethene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Chloroform	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
1,1,1-Trichloroethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Carbon Tetrachloride	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
1,2-Dichloroethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Benzene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Trichloroethene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
1,2-Dichloropropane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Bromodichloromethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
2-Chloroethyl vinyl ether	µg/L	5.0 U	5.0 U	5.00 U	5.00 U	5.00 U	5.0 U	5.0 U	5.0 U	5.00 U	5.00 U	5.00 U	5.0 U	5.0 U	5.00 U	5.00 U	5.00 U
4-Methyl-2-Pentanone (MIBK)	µg/L	5.0 U	25 U	25.0 U	25.0 U	25.0 U	5.0 U	25 U	25 U	25.0 U	25.0 U	25.0 U	5.0 U	25 U	25.0 U	25.0 U	25.0 U
cis-1,3-Dichloropropene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Toluene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
trans-1,3-Dichloropropene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
2-Hexanone	µg/L	5.0 U	25 U	25.0 U	25.0 U	25.0 U	5.0 U	25 U	25 U	25.0 U	25.0 U	25.0 U	5.0 U	25 U	25.0 U	25.0 U	25.0 U
1,1,2-Trichloroethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Tetrachloroethene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Dibromochloromethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Chlorobenzene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Ethylbenzene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
m,p-Xylene	µg/L	2.0 U	2.0 U	1.00 U	2.00 U	2.00 U	2.0 U	2.0 U	2.0 U	1.00 U	2.00 U	2.00 U	2.0 U	2.0 U	1.00 U	2.00 U	2.00 U
o-Xylene	µg/L	1.0 U	1.0 U	2.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	2.00 U	1.00 U	1.00 U	1.0 U	1.0 U	2.00 U	1.00 U	1.00 U
Styrene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Bromoform	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
1,1,2,2-Tetrachloroethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U

Table A3-2. Minimum Functional Standard and Organic Parameters in Groundwater, Midway Landfill, Sand Aquifer, 2015-2019 Data Summary

		MW-17B (UP)					MW-21B (UP)				
		R-62	R-63	R-64	R-65	R-66	R-62	R-63	R-64	R-65	R-66
Compound	Units	5/5/2015	5/3/2016	5/2/2017	5/9/2018	5/8/2019	5/5/2015	5/3/2016	5/2/2017	5/9/2018	5/8/2019
Field Parameters											
pH	s.u.	6.77	6.85	6.90	7.09	7.00	6.99	6.99	7.02	7.20	7.16
Conductivity	µmhos/cm	328	346	345	745.6	342.4	604	589	571	1206	566.8
Temperature	C	12.1	12.4	11.9	12.2	12.0	11.3	11.7	11.5	11.8	11.3
Conventional Parameters											
Chloride	mg/L	10.8	11.3	12.1	10.7	11.3	12.3	11.3	11.6	9.84	10.2
Sulfate	mg/L	21.9	22.2	23.0	23.2	20.8	92.3	82.6	82.4	92.9	93.3
Chemical Oxygen Demand	mg/L	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Total Organic Carbon	mg/L	1.50 U	1.01	1.01	0.97	1.03	1.50 U	1.10	1.01	1.09	1.02
Dissolved Metals											
Iron	mg/L	0.05 U	0.05 U	0.0500 U	0.0500 U	0.0500 U	0.05 U	0.05 U	0.0500 U	0.0500 U	0.0500 U
Manganese	mg/L	0.046	0.044	0.0425	0.0315	0.0330	0.372	0.342	0.346	0.341	0.345
Semi-Volatile Organics											
1,4-Dioxane	µg/L	1.5	1.0	1.5	0.9	0.7	2.8	1.9	1.7	1.9	1.5
Volatile Organics											
Chloromethane	µg/L	1.0 U	2.5 U	2.50 U	2.50 U	2.50 U	1.0 U	2.5 U	2.50 U	2.50 U	2.50 U
Vinyl Chloride	µg/L	0.11	0.20 U	0.20 U	0.0375	0.200 U	0.031	0.20 U	0.20 M, U	0.0299	0.200 U
Bromomethane	µg/L	1.0 U	5.0 U	5.00 U	5.00 U	5.00 U	1.0 U	5.0 U	5.00 U	5.00 U	5.00 U
Chloroethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Trichlorofluoromethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.9	1.8 Q	1.98	1.52	1.00
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/L	2.0 U	1.0 U	1.00 U	1.00 U	1.00 U	2.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Acetone	µg/L	10 U	25 U	25.0 U	25.0 U	25.0 U	10 U	25 U	25.0 U	25.0 U	25.0 U
1,1-Dichloroethene	µg/L	1.4	1.4	1.10	1.03	1.19	2.5	2.9	2.62	3.04	2.85
Methylene Chloride	µg/L	2.0 U	5.0 U	5.00 U	5.00 U	5.00 U	2.0 U	5.0 U	5.00 U	5.00 U	5.00 U
Carbon Disulfide	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
trans-1,2-Dichloroethene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Vinyl Acetate	µg/L	5.0 U	1.0 U	1.00 U	1.00 U	1.00 U	5.0 U	1.0 U	1.00 U	1.00 U	1.00 U
1,1-Dichloroethane	µg/L	20	19	13.1	12.9	14.6	2.6	2.4	2.30	2.56	2.39
2-Butanone	µg/L	5.0 U	25 U	25.0 U	25.0 U	25.0 U	5.0 U	25 U	25.0 U	25.0 U	25.0 U
cis-1,2-Dichloroethene	µg/L	2.8	2.5	2.50	2.36	2.58	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Chloroform	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
1,1,1-Trichloroethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.7	1.4	1.25	1.66	1.08
Carbon Tetrachloride	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
1,2-Dichloroethane	µg/L	2.8	2.6	2.11	2.10	2.14	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Benzene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Trichloroethene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	4.6	4.6	5.92	6.68	6.26
1,2-Dichloropropane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Bromodichloromethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
2-Chloroethyl vinyl ether	µg/L	5.0 U	5.0 U	5.00 U	5.00 U	5.00 U	5.0 U	5.0 U	5.00 U	5.00 U	5.00 U
4-Methyl-2-Pentanone (MIBK)	µg/L	5.0 U	25 U	25.0 U	25.0 U	25.0 U	5.0 U	25 U	25.0 U	25.0 U	25.0 U
cis-1,3-Dichloropropene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Toluene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
trans-1,3-Dichloropropene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
2-Hexanone	µg/L	5.0 U	25 U	25.0 U	25.0 U	25.0 U	5.0 U	25 U	25.0 U	25.0 U	25.0 U
1,1,2-Trichloroethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Tetrachloroethene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	110	110	130	128	118
Dibromochloromethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Chlorobenzene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Ethylbenzene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
m,p-Xylene	µg/L	2.0 U	2.0 U	1.00 U	2.00 U	2.00 U	2.0 U	2.0 U	1.00 U	2.00 U	2.00 U
o-Xylene	µg/L	1.0 U	1.0 U	2.00 U	1.00 U	1.00 U	1.0 U	1.0 U	2.00 U	1.00 U	1.00 U
Styrene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
Bromoform	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U
1,1,2,2-Tetrachloroethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U

Table A3-3. Minimum Functional Standard and Organic Parameters in Groundwater, Midway Landfill, Southern Gravel Aquifer, 2015-2019 Data Summary

		MW-14B (DOWN)						MW-20B (DOWN)					
		R-62	R-63	R-64	R-65	R-66		R-62	R-63	R-64	R-65		R-66
Compound	Units	5/5/2015	5/3/2016	5/2/2017	5/8/2018	5/7/2019	Duplicate (MW-35) 5/7/2019	5/6/2015	5/4/2016	5/3/2017	5/9/2018	Duplicate (MW-35) 5/9/2018	5/8/2019
Field Parameters													
pH	s.u.	6.62	6.66	6.63	6.79	6.76	--	6.89	6.88	6.91	7.10	--	7.08
Conductivity	µmhos/cm	622	618	618	623.6	640.4	--	927	857	772	1548	--	696.5
Temperature	C	14.0	14.6	14.1	14.5	14.6	--	12.0	11.6	12.6	11.9	--	11.7
Conventional Parameters													
Chloride	mg/L	13.5	12.7	14.9	17.4	20.3	19.7	22.4	19.2	18.2	17.2	15.8	14.9
Sulfate	mg/L	29.7	24.9	23.9	25.6	21.8	21.8	12.5	13.7	13.8	15.4	15.5	14.7
Chemical Oxygen Demand	mg/L	10.0 U	18.4	10.0 U	10.0 U	10.0 U	10.0 U	12.2	28.3	10.0 U	10.0 U	10.0 U	10.0 U
Total Organic Carbon	mg/L	1.50 U	1.30	1.15	1.21	1.38	1.35	3.76	3.39	3.16	2.90	2.83	2.48
[illegible]													
Iron	mg/L	9.62	9.30	9.23	8.64	8.76	8.73	6.31	5.80	4.29	4.52	4.53	4.27
Manganese	mg/L	0.861	0.837	0.834	0.867	0.884	0.877	2.27	2.11	1.92	1.70	1.71	1.61
Semi-Volatile Organics													
1,4-Dioxane	µg/L	4.1	5.4	6.8	10.3	10.3	9.6	27	18	19.9	17.8	19.0	12.9
Volatile Organics													
Chloromethane	µg/L	1.0 U	2.5 U	2.50 U	2.50 U	2.50 U	2.50 U	1.0 U	2.5 U	2.50 U	2.50 U	2.50 U	2.50 U
Vinyl Chloride	µg/L	0.24	0.20 U	0.20 M	0.104	0.200 U	0.200 U	0.29	0.33 M	0.346	0.257	0.266	0.200 U
Bromomethane	µg/L	1.0 U	5.0 U	5.00 U	5.00 U	5.00 U	5.00 U	1.0 U	5.0 U	5.00 U	5.00 U	5.00 U	5.00 U
Chloroethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Trichlorofluoromethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/L	2.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	2.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Acetone	µg/L	10 U	25 U	25.0 U	25.0 U	25.0 U	25.0 U	10 U	25 U	25.0 U	25.0 U	25.0 U	25.0 U
1,1-Dichloroethene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Methylene Chloride	µg/L	2.0 U	5.0 U	5.00 U	5.00 U	5.00 U	5.00 U	2.0 U	5.0 U	5.00 U	5.00 U	5.00 U	5.00 U
Carbon Disulfide	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
trans-1,2-Dichloroethene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Vinyl Acetate	µg/L	5.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	5.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
1,1-Dichloroethane	µg/L	1.0 U	1.0	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
2-Butanone	µg/L	5.0 U	25 U	25.0 U	25.0 U	25.0 U	25.0 U	5.0 U	25 U	25.0 U	25.0 U	25.0 U	25.0 U
cis-1,2-Dichloroethene	µg/L	3.0	3.0	3.50	3.53	3.52	3.21	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Chloroform	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
1,1,1-Trichloroethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Carbon Tetrachloride	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
1,2-Dichloroethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Benzene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Trichloroethene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
1,2-Dichloropropane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Bromodichloromethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
2-Chloroethyl vinyl ether	µg/L	5.0 U	5.0 U	5.00 U	5.00 U	5.00 U	5.00 U	5.0 U	5.0 U	5.00 U	5.00 U	5.00 U	5.00 U
4-Methyl-2-Pentanone (MIBK)	µg/L	5.0 U	25 U	25.0 U	25.0 U	25.0 U	25.0 U	5.0 U	25 U	25.0 U	25.0 U	25.0 U	25.0 U
cis-1,3-Dichloropropene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Toluene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
trans-1,3-Dichloropropene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
2-Hexanone	µg/L	5.0 U	25 U	25.0 U	25.0 U	25.0 U	25.0 U	5.0 U	25 U	25.0 U	25.0 U	25.0 U	25.0 U
1,1,2-Trichloroethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Tetrachloroethene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Dibromochloromethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Chlorobenzene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Ethylbenzene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
m,p-Xylene	µg/L	2.0 U	2.0 U	1.00 U	2.00 U	2.00 U	2.00 U	2.0 U	2.0 U	1.00 U	2.00 U	2.00 U	2.00 U
o-Xylene	µg/L	1.0 U	1.0 U	2.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	2.00 U	1.00 U	1.00 U	1.00 U
Styrene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Bromoform	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
1,1,2,2-Tetrachloroethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U

Table A3-3. Minimum Functional Standard and Organic Parameters in Groundwater, Midway Landfill, Southern Gravel Aquifer, 2015-2019 Data Summary

		MW-23B (DOWN)							MW-29B (DOWN)							
		R-62		R-63	R-64		R-65	R-66	R-62		R-63	R-64		R-65	R-66	
Compound	Units	5/7/2015	Duplicate (MW-35) 5/7/15	5/5/2016	5/4/2017	Duplicate (MW-35) 5/4/2017	5/7/2018	5/6/2019	5/4/2015	Duplicate (MW-31) 5/4/15	5/2/2016	5/1/2017	Duplicate (MW-31) 5/1/2017	5/7/2018	5/6/2019	Duplicate (MW-31) 5/6/2019
Field Parameters																
pH	s.u.	6.55	--	6.50	6.53	--	6.71	6.69	6.60	--	6.59	6.63	--	6.77	6.76	--
Conductivity	µmhos/cm	491	--	478	470	--	468.8	476.9	635	--	624	612	--	608.6	622.7	--
Temperature	C	11.7	--	11.9	11.8	--	11.7	11.8	10.5	--	11.3	10.2	--	10.4	10.6	--
Conventional Parameters																
Chloride	mg/L	9.4	9.5	9.2	10.7	10.5	9.54	9.58	21.2	21.6	20.3	19.5	19.5	16.9	17.1	17.2
Sulfate	mg/L	29.1	29.1	28.0	25.3	25.4	23.7	26.1	22.7	22.4	19.4	19.6	19.8	18.8	19.4	19.3
Chemical Oxygen Demand	mg/L	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	18.4	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Total Organic Carbon	mg/L	1.50 U	1.50 U	1.16	1.10	1.07	1.08	0.95	1.69	1.65	1.73	1.40	1.73	1.38	1.32	1.30
Iron	mg/L	7.26	7.26	7.58	7.21	7.11	6.22	7.01	12.8	12.8	12.7	11.9	12.7	10.4	12.1	11.7
Manganese	mg/L	0.121	0.121	0.123	0.118	0.115	0.105	0.109	0.858	0.861	0.830	0.820	0.817	0.805	0.812	0.801
Semi-Volatile Organics																
1,4-Dioxane	µg/L	1.3	1.2	1.5	2.0	2.3	2.1	1.8	7.9 J	12 J	11	13.8	11.7	12.5	8.8	9.0
Volatile Organics																
Chloromethane	µg/L	1.0 U	1.0 U	2.5 U	2.50 U	2.50 U	2.50 U	2.50 U	1.0 U	1.0 U	2.5 U	2.50 U	2.50 U	2.50 U	2.50 U	2.50 U
Vinyl Chloride	µg/L	0.098	0.099	0.20 U	0.20 M,	0.20 M, U	0.0866	0.200 U	0.48	0.44	0.49 M	0.516	0.450	0.335	0.337	0.330
Bromomethane	µg/L	1.0 U	1.0 U	5.0 U	5.00 U	5.00 U	5.00 U	5.00 U	1.0 U	1.0 U	5.0 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
Chloroethane	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Trichlorofluoromethane	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/L	2.0 U	2.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	2.0 U	2.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Acetone	µg/L	10 U	10 U	25 U	25.0 U	25.0 U	25.0 U	25.0 U	10 U	10 U	25 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U
1,1-Dichloroethene	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Methylene Chloride	µg/L	2.0 U	2.0 U	5.0 U	5.00 U	5.00 U	5.00 U	5.00 U	2.0 U	2.0 U	5.0 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
Carbon Disulfide	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
trans-1,2-Dichloroethene	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Vinyl Acetate	µg/L	5.0 U	5.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	5.0 U	5.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,1-Dichloroethane	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
2-Butanone	µg/L	5.0 U	5.0 U	25 U	25.0 U	25.0 U	25.0 U	25.0 U	5.0 U	5.0 U	25 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U
cis-1,2-Dichloroethene	µg/L	2.7	2.7	2.7	2.71	2.59	2.42	2.61	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.03	1.08
Chloroform	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,1,1-Trichloroethane	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Carbon Tetrachloride	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,2-Dichloroethane	µg/L	1.7	1.7	2.2	1.56	1.49	1.48	1.81	3.8	3.9	3.9	3.54	3.52	3.37	3.92	3.91
Benzene	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Trichloroethene	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,2-Dichloropropane	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Bromodichloromethane	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
2-Chloroethyl vinyl ether	µg/L	5.0 U	5.0 U	5.0 U	5.00 U	5.00 U	5.00 U	5.00 U	5.0 U	5.0 U	5.0 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
4-Methyl-2-Pentanone (MIBK)	µg/L	5.0 U	5.0 U	25 U	25.0 U	25.0 U	25.0 U	25.0 U	5.0 U	5.0 U	25 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U
cis-1,3-Dichloropropene	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Toluene	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
trans-1,3-Dichloropropene	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
2-Hexanone	µg/L	5.0 U	5.0 U	25 U	25.0 U	25.0 U	25.0 U	25.0 U	5.0 U	5.0 U	25 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U
1,1,2-Trichloroethane	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Tetrachloroethene	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Dibromochloromethane	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Chlorobenzene	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Ethylbenzene	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
m,p-Xylene	µg/L	2.0 U	2.0 U	2.0 U	1.00 U	1.00 U	2.00 U	2.00 U	2.0 U	2.0 U	2.0 U	1.00 U	1.00 U	2.00 U	2.00 U	2.00 U
o-Xylene	µg/L	1.0 U	1.0 U	1.0 U	2.00 U	2.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	2.00 U	2.00 U	1.00 U	1.00 U	1.00 U
Styrene	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Bromoform	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,1,2,2-Tetrachloroethane	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U

Table A3-3. Minimum Functional Standard and Organic Parameters in Groundwater, Midway Landfill, Southern Gravel Aquifer, 2015-2019 Data Summary

		MW-30C (DOWN)						
		R-62	R-63		R-64	R-65		R-66
Compound	Units	5/4/2015	5/2/2016	Duplicate (MW-31) 5/2/2016	5/1/2017	5/7/2018	Duplicate (MW-31) 5/7/2018	5/6/2019
Field Parameters								
pH	s.u.	7.10	7.08	--	7.13	7.39	--	7.34
Conductivity	µmhos/cm	311	313	--	317	323.8	--	328.8
Temperature	C	10.6	11.1	--	9.5	9.9	--	10.3
Conventional Parameters								
Chloride	mg/L	12.2	10.6	11.2	11.9	10.7	10.3	10.8
Sulfate	mg/L	14.3	12.7	12.5	13.3	13.3	13.1	15.5
Chemical Oxygen Demand	mg/L	10.0 U	10.0 U	11.6	10.0 U	10.0 U	10.0 U	10.0 U
Total Organic Carbon	mg/L	1.50 U	0.74	0.90	0.63	0.73	0.65	0.59
Iron	mg/L	2.39	2.30	2.32	2.25	2.11	2.31	2.15
Manganese	mg/L	0.678	0.638	0.639	0.663	0.644	0.691	0.669
Semi-Volatile Organics								
1,4-Dioxane	µg/L	4.2	4.4	4.7	6.4	5.6	5.5	4.8
Volatile Organics								
Chloromethane	µg/L	1.0 U	2.5 U	2.5 U	2.50 U	2.50 U	2.50 U	2.50 U
Vinyl Chloride	µg/L	0.200	0.210 M	0.200 M	0.241	0.172	0.173	0.200 U
Bromomethane	µg/L	1.0 U	5.0 U	5.0 U	5.00 U	5.00 U	5.00 U	5.00 U
Chloroethane	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Trichlorofluoromethane	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/L	2.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Acetone	µg/L	10 U	25 U	25 U	25.0 U	25.0 U	25.0 U	25.0 U
1,1-Dichloroethene	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Methylene Chloride	µg/L	2.0 U	5.0 U	5.0 U	5.00 U	5.00 U	5.00 U	5.00 U
Carbon Disulfide	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
trans-1,2-Dichloroethene	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Vinyl Acetate	µg/L	5.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
1,1-Dichloroethane	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
2-Butanone	µg/L	5.0 U	25 U	25 U	25.0 U	25.0 U	25.0 U	25.0 U
cis-1,2-Dichloroethene	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Chloroform	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
1,1,1-Trichloroethane	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Carbon Tetrachloride	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
1,2-Dichloroethane	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.03
Benzene	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Trichloroethene	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
1,2-Dichloropropane	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Bromodichloromethane	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
2-Chloroethyl vinyl ether	µg/L	5.0 U	5.0 U	5.0 U	5.00 U	5.00 U	5.00 U	5.00 U
4-Methyl-2-Pentanone (MIBK)	µg/L	5.0 U	25 U	25 U	25.0 U	25.0 U	25.0 U	25.0 U
cis-1,3-Dichloropropene	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Toluene	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
trans-1,3-Dichloropropene	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
2-Hexanone	µg/L	5.0 U	25 U	25 U	25.0 U	25.0 U	25.0 U	25.0 U
1,1,2-Trichloroethane	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Tetrachloroethene	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Dibromochloromethane	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Chlorobenzene	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Ethylbenzene	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
m,p-Xylene	µg/L	2.0 U	2.0 U	2.0 U	1.00 U	2.00 U	2.00 U	2.00 U
o-Xylene	µg/L	1.0 U	1.0 U	1.0 U	2.00 U	1.00 U	1.00 U	1.00 U
Styrene	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
Bromoform	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U
1,1,2,2-Tetrachloroethane	µg/L	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U

Table A3-4. Minimum Functional Standard and Organic Parameters in Groundwater, Midway Landfill, Field and Trip Blanks, 2015-2019 Data Summary

		Field Blanks					Trip Blanks																			
		R-62	R-63	R-64	R-65	R-66	R-62				R-63				R-64				R-65			R-66		
Compound	Units	5/6/2015	5/5/2016	5/3/2017	5/8/2018	5/7/2019	5/4/2015	5/5/2015	5/6/2015	5/7/2015	5/2/2016	5/3/2016	5/4/2016	5/5/2016	5/1/2017	5/2/2017	5/3/2017	5/4/2017	5/7/2018	5/8/2018	5/9/2018	5/6/2019	5/7/2019	5/8/2019
Field Parameters																								
pH	s.u.	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Conductivity	µmhos/cm	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Temperature	C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Conventional Parameters																								
Chloride	mg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfate	mg/L	2.0 U	2.0 U	2.00 U	2.00 U	2.00 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chemical Oxygen Demand	mg/L	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Organic Carbon	mg/L	1.50 U	1.15	0.50 U	0.50 U	0.50 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dissolved Metals																								
Iron	mg/L	0.05 U	0.05 U	0.0500 U	0.0500 U	0.0500 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	mg/L	0.001 U	0.002	0.0010 U	0.0010 U	0.0010 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Semi-Volatile Organics																								
1,4-Dioxane	µg/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Volatile Organics																								
Chloromethane	µg/L	1.0 U	2.5 U	2.50 U	2.50 U	2.50 U	1.0 U	1.0 U	1.0 U	1.0 U	2.5 U	2.5 U	2.5 U	2.5 U	2.50 U	2.50 U	2.50 U	2.50 U	2.50 U	2.50 U	2.50 U	2.50 U	2.50 U	2.50 U
Vinyl Chloride	µg/L	0.020 U	0.20 U	0.20 U	0.020 U	0.200 U	0.020 U	0.020 U	0.020 U	0.020 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.20 U	0.020 U	0.020 U	0.020 U	--	0.200 U	0.200 U
Bromomethane	µg/L	1.0 U	5.0 U	5.00 U	5.00 U	5.00 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
Chloroethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Trichlorofluoromethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/L	2.0 U	1.0 U	1.00 U	1.00 U	1.00 U	2.0 U	2.0 U	2.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Acetone	µg/L	10 U	25 U	25.0 U	25.0 U	25.0 U	10 U	10 U	10 U	10 U	25 U	25 U	25 U	25 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U
1,1-Dichloroethene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Methylene Chloride	µg/L	7.9	5.0 U	5.00 U	5.00 U	5.00 U	2.0 U	2.0 U	2.0 U	2.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
Carbon Disulfide	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
trans-1,2-Dichloroethene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Vinyl Acetate	µg/L	5.0 U	1.0 U	1.00 U	1.00 U	1.00 U	5.0 U	5.0 U	5.0 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,1-Dichloroethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
2-Butanone	µg/L	5.0 U	25 U	25.0 U	25.0 U	25.0 U	5.0 U	5.0 U	5.0 U	5.0 U	25 U	25 U	25 U	25 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U
cis-1,2-Dichloroethene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Chloroform	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,1,1-Trichloroethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Carbon Tetrachloride	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,2-Dichloroethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Benzene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Trichloroethene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,2-Dichloropropane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Bromodichloromethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
2-Chloroethyl vinyl ether	µg/L	5.0 U	5.0 U	5.00 U	5.00 U	5.00 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U	5.00 U
4-Methyl-2-Pentanone (MIBK)	µg/L	5.0 U	25 U	25.0 U	25.0 U	25.0 U	5.0 U	5.0 U	5.0 U	5.0 U	25 U	25 U	25 U	25 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U
cis-1,3-Dichloropropene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Toluene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
trans-1,3-Dichloropropene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
2-Hexanone	µg/L	5.0 U	25 U	25.0 U	25.0 U	25.0 U	5.0 U	5.0 U	5.0 U	5.0 U	25 U	25 U	25 U	25 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U
1,1,2-Trichloroethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Tetrachloroethene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Dibromochloromethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Chlorobenzene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Ethylbenzene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
m,p-Xylene	µg/L	2.0 U	2.0 U	1.00 U	2.00 U	2.00 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	1.00 U	1.00 U	1.00 U	1.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U
o-Xylene	µg/L	1.0 U	1.0 U	2.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.00 U	2.00 U	2.00 U	2.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Styrene	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Bromoform	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
1,1,2,2-Tetrachloroethane	µg/L	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U

Table A-3 Notes:

UP or DOWN in column title denotes whether the well is located upgradient or down gradient of the landfills influence.
U = Indicated the compound was undetected at the reported concentration
J = Indicated the compound was detected at an estimated concentration
M = Estimated value for an analyte detected and confirmed by an analyst but with low spectral match parameters. This flag is used only for GC-MS analyses
Q = Indicates a detected analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20%Drift or minimum RRF)
- - = Not analyzed
R-62 = Round 62, May 2015
R-63 = Round 63, May 2016
R-64 = Round 64, May 2017
R-65 = Round 65, May 2018
R-66 = Round 66, May 2019

APPENDIX K – GROUNDWATER ANNUAL NOTICE

City of Seattle
Seattle Public Utilities

TRANSMITTAL

June 2, 2020

TO: Mark Adams, Washington State Department of Ecology
Yolanda Pon, Public Health Seattle King County
Highline Water District
Lakehaven Utility District
Active Well Drillers in King County (Washington State Department of Ecology list)
Owner of Well 37

Re: Midway Landfill Annual Groundwater Conditions Report
Informational – No Action Required

Enclosed is the annual notice of groundwater conditions in affected areas downgradient of the Midway Landfill for 2019. This is being sent to you pursuant to the requirements in the Midway Landfill Record of Decision (ROD) between the City of Seattle and the United States Environmental Protection Agency, and in compliance with a Consent Decree between the City of Seattle and the Washington State Department of Ecology (Ecology).

The City of Seattle is required to annually notify the Seattle-King County Department of Public Health, Ecology, the local water districts, and locally active well drillers of groundwater conditions in the affected areas downgradient of the Midway Landfill. You are hereby notified that no water supply wells are to be constructed or used in the areas of known groundwater contamination listed in Table 1 and shown on Figure 2.

If you have any questions or require additional information, please contact me at jeff.neuner@seattle.gov or at 206-684-7693.

Sincerely,

Jeff Neuner
Midway Landfill Manager

Enclosure

Mami Hara, General Manager/CEO
Seattle Public Utilities
PO Box 34018
Seattle, WA 98124-4018

Tel (206) 684-5851
Fax (206) 684-4631
TDD (206) 233-7241
http://www.seattle.gov/util

City of Seattle
Seattle Public Utilities

2019 ANNUAL NOTICE OF GROUNDWATER CONDITIONS IN AFFECTED AREAS DOWNGRADIENT OF THE MIDWAY LANDFILL[1]

For Informational Purposes Only—No Action Required

The City of Seattle is the owner and previous operator of the Midway Landfill, located north of South 252nd Street between SR-99 and I-5 in Kent, Washington (Figure 1).

Extensive testing of groundwater within and surrounding the landfill area has indicated the presence of various contaminants that do not meet federal drinking water standards (Maximum Contaminant Levels [MCLs]) or state groundwater standards (Model Toxic Control Act [MTCA; WAC 173-340] Method B cleanup levels).

Cleanup levels for contaminants of concern (COCs) were established in a Record of Decision (ROD) between the City of Seattle and the United States Environmental Protection Agency.

A summary of the concentrations of COCs and additional parameters in groundwater with concentrations greater than MCLs or MTCA B cleanup levels are presented in Table 1. The locations of wells with concentrations of COCs above ROD cleanup levels are shown on Figure 2.

In compliance with a Consent Decree between the City of Seattle and the Washington State Department of Ecology (Ecology), and in accordance with the ROD, Ecology and all appropriate local health districts, water districts, and certified well drillers are hereby notified that no water supply wells are to be constructed or used in the areas of known groundwater contamination as indicated on Table 1 and shown on Figure 2.

This is an annual notification.

[1] The City will annually notify the Seattle-King County Department of Public Health, Ecology, the local water districts, and locally active well drillers in writing of groundwater conditions in the affected areas downgradient of the landfill.

Mami Hara, SPU General Manager/CEO
Seattle Public Utilities
700 5th Avenue, Suite 4900
PO Box 34018
Seattle, WA 98124-4018

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0 250 500 750
Feet

City of Seattle, Seattle Public Utilities Owned Parcel Boundary That Includes Midway Landfill

Figure 1
Site Location Map
Midway Landfill
Kent, Washington

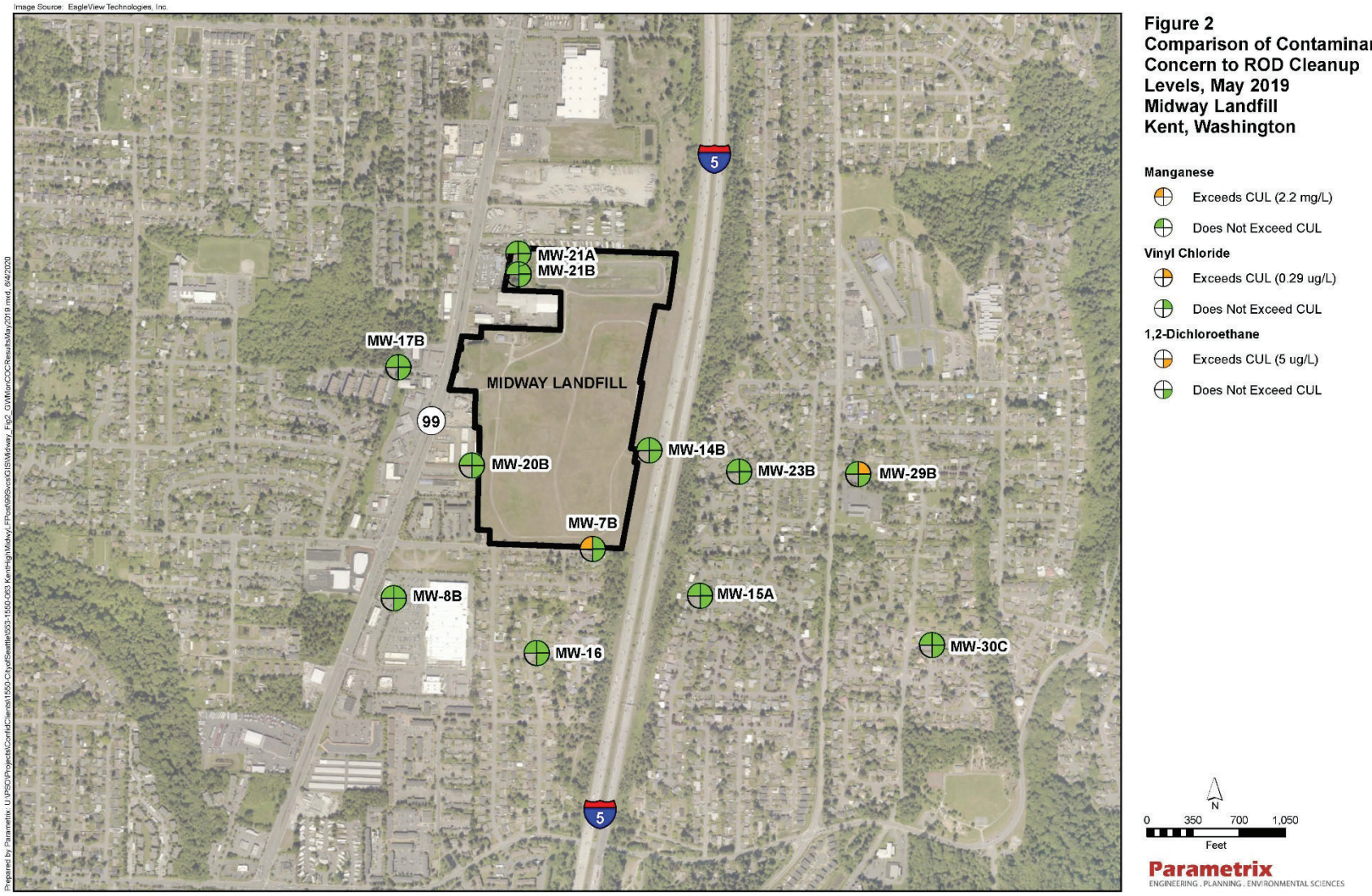

Figure 2
Comparison of Contaminants of Concern to ROD Cleanup Levels, May 2019
Midway Landfill
Kent, Washington

Table 1. Groundwater Concentrations of Contaminants of Concern and Additional Parameters Not Included in the ROD, Midway Landfill, May 2019

			Upper Gravel Aquifer		Sand Aquifer					Southern Gravel Aquifer				
			MW-16 UP	MW-21A UP	MW-7B DOWN	MW-8B UP	MW-15A DOWN	MW-17B UP	MW-21B UP	MW-14B DOWN	MW-20B DOWN	MW-23B DOWN	MW-29B DOWN	MW-30C DOWN
Compound	**Units**	**Comparison Standards**	**5/7/2019**	**5/8/2019**	**5/7/2019**	**5/7/2019**	**5/6/2019**	**5/8/2019**	**5/8/2019**	**5/7/2019**	**5/8/2019**	**5/6/2019**	**5/6/2019**	**5/6/2019**
Contaminants of Concern														
		ROD Cleanup Level[a]												
Manganese	mg/L	2.2	0.0950	0.0010 U	**2.32**	0.275	0.0010 U	0.0330	0.345	0.884	1.61	0.109	0.812	0.669
Vinyl Chloride	µg/L	0.29[b]	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.200 U	0.20 U	**0.337**	0.200 U
1,2-Dichloroethane	µg/L	5	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	2.14	1.00 U	1.00 U	1.00 U	1.81	3.92	1.03
Parameters Not Included in the ROD [c]														
		MCL[d]	MTCA B[e]											
Dissolved Metals														
Iron	mg/L	0.3**		0.0816	0.0500 U	**1.76**	0.0677	0.0500 U	0.0500 U	0.0500 U	**8.76**	**4.27**	**7.01**	**12.1**	**2.15**
Semi-Volatile Organics														
1,4-Dioxane	µg/L		0.44	0.4 U	0.4 U	**1.3**	0.4 U	0.4 U	**0.7**	**1.5**	**10.3**	**12.9**	**1.8**	**8.8**	**4.8**
Volatile Organics														
1,1-Dichloroethane	µg/L		7.7	1.00 U	1.00 U	1.35	1.00 U	1.00 U	**14.6**	2.39	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Trichloroethene	µg/L	5*	4	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	**6.26**	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U
Tetrachloroethene	µg/L	5*	5	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U	**118**	1.00 U	1.00 U	1.00 U	1.00 U	1.00 U

Notes:

ROD = Record of Decision

UP or DOWN in column title denotes whether the well is located upgradient or downgradient of the landfill's influence.

[a] = Cleanup levels established in the Final EPA ROD for the Midway Landfill Site, September 6, 2000.

[b] = The revised cleanup level for vinyl chloride is 0.29 µg/L using the MTCA adjusted cancer risk of 1e-5.

[c] = Only includes parameters that have concentrations greater than MCL or MTCA B cleanup level

[d] = MCL/Federal maximum contaminant level.

[e] = MTCA B/Model Toxics Control Act (WAC 173-340) Method B Cleanup Level. CLARC II Database, Ecology.

Bold = Exceeds cleanup level established in the Final EPA ROD for the Midway Landfill Site, September 6, 2000 for COCs or exceeds Federal MCL or MTCA Method B Groundwater Cleanup Level for parameters not included in the ROD.

U = Indicates the compound was undetected at the reported concentration.

* = Primary MCL Standards; EPA National Primary Drinking Water Regulations (40 CFR 141 59 FR 34322).

** = Secondary MCL Standards; EPA National Primary Drinking Water Regulations (40 CFR 141 59 FR 34322).